FINAL
ENVIRONMENTAL ASSESSMENT

C-17 Program Changes

United States Air Force
Air Education and Training Command
Altus Air Force Base, Oklahoma

July 2004

Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE **JUL 2004**	2. REPORT TYPE	3. DATES COVERED **00-00-2004 to 00-00-2004**

4. TITLE AND SUBTITLE **Final Environmental Assessment C-17 Program Changes Altus Air Force Base, Oklahoma**	5a. CONTRACT NUMBER 5b. GRANT NUMBER 5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER 5e. TASK NUMBER 5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **Science Applications International Corporation (SAIC),4242 Woodcock Ste 150,San Antonio,TX,78228**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S) 11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT
The proposed action includes the beddown of up to eight additional C-17 aircraft at Altus Air Force Base (AFB), Oklhoma. In addition, by the end of Fiscal Year 2007, all C-5 aircraft, associated manpower, support, and equipment would be transferred from Altus. Existing C-5 facilities would be converted to C-17 use and new C-17 facilities would be constructed. Furthermore, KC-135 transition training would be accomplished at other airfields. Altus AFB C-17 aircrews would accomplish low-level navigation training on 14 existing Military Training Routes that are scheduled and coordinated by Air Force Navy, and Air National Guard units at other Air Force bases and military installations in Oklahoma and Texas. C-17 aircraft would use the same transition airfields that are currently used by Altus AFB. However, the transition airfields would be used at a higher rate than the current C-17 utilization. To accommodate the increased utilization rate of the ALZ due to the additional C-17s, the KC-135 transition training would be decreased at Altus AFB with a corresponding increase at other transition locations (proposed action). As an alternative, Altus AFB could construct an Assault Landing Zone (ALZ) at one of four candidate locations. C-17 aircraft would use the same transition fields that are currently used by Altus AFB. However, transition fields would be used at a higher rate than current C-17 use. Conversely, the Air Force could elect to take no action (no-action alternative). The following biophysical resources were identified for study at Altus AFB, Sooner Drop Zone, Clinton-Sherman Industrial Airpark, Amarillo International Airport (IAP), and Lubbock IAP: noise, air quality, earth resources, water resources, hazardous materials biological resources, cultural resources, socioeconomics, and infrastructure/utilities, as applicable.

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			
unclassified	**unclassified**	**unclassified**	**Same as Report (SAR)**	**383**	

FINAL

FINDING OF NO SIGNIFICANT IMPACT

C-17 PROGRAM CHANGES
ALTUS AIR FORCE BASE, OKLAHOMA

AGENCY: United States Air Force

COOPERATING AGENCY: Federal Aviation Administration

PURPOSE: The 97th Air Mobility Wing (97 AMW) at Altus Air Force Base (AFB) has prepared an environmental assessment (EA) for the beddown of up to eight additional C-17 aircraft. This EA has been accomplished pursuant to the National Environmental Policy Act (NEPA); the Council of Environmental Quality regulations implementing the NEPA; Department of Defense (DoD) Directive 6050.1, *Environmental Effects in the United States of DoD Actions*; and Air Force Instruction (AFI) 32-7061, *The Environmental Impact Analysis Process*, which implements these regulations. This EA is attached and incorporated by reference.

PROPOSED ACTION: The proposed action is the beddown of up to eight additional C-17 aircraft at Altus AFB. By the end of Fiscal Year 2007, all C-5 aircraft, associated manpower, support, and equipment will be transferred from Altus AFB. Many existing C-5 facilities will be converted to C-17 use and new C-17 facilities will be constructed. Furthermore, KC-135 transition training will be accomplished at other airfields. Altus AFB C-17 aircrews will accomplish low-level navigation training on 14 existing Military Training Routes (MTRs) that are scheduled and coordinated by Air Force, Navy, and Air National Guard units at other Air Force bases and military installations in Oklahoma and Texas. C-17 aircraft will use the same transition airfields that are currently used by Altus AFB. However, the transition airfields will be used at a higher rate than the current C-17 utilization, including operations at Amarillo International Airport (IAP) and Lubbock IAP. To accommodate the increased utilization rate of the ALZ due to the additional C-17s, the KC-135 transition training will be decreased at Altus AFB with a corresponding increase at other transition locations.

FORESEEABLE ACTIONS: Foreseeable actions include the proposed construction and operation of an Assault Landing Zone (ALZ) for C-17 aircraft in the vicinity of the Sooner Drop Zone (DZ) or at Clinton-Sherman Industrial Airpark (CSIA). The Air Force plans to expand Sooner DZ and construct a Defense Access Road in the vicinity of Sooner DZ. In addition, the Air Force has announced the construction of a Base Civil Engineer Complex, Military Family Housing Privatization, and a Digital Airport Surveillance Radar Facility at Altus AFB. Also, construction and operation of a commercial launch and landing site by the Oklahoma Space Industry Development Authority (OSIDA) has been proposed at CSIA.

SUMMARY OF FINDINGS: This EA evaluates potential impacts on the environment at Altus AFB, Sooner DZ, CSIA, Amarillo IAP, and Lubbock IAP from the proposed projects. Potential impacts are summarized below:

Noise. Changes in aircraft operations at Altus AFB and Amarillo IAP will result in the reduction in the total acreage of land exposed to noise levels of L_{dn} 65 dBA or higher. There will be additional land exposed to those noise levels at CSIA and Lubbock IAP. Increases

would not result in significant impacts. No change in noise in the vicinity of the Sooner DZ. Potential cumulative impacts from other projects in the Region of Influence would also increase noise only slightly. Impacts will not be significant.

Air Quality. The maximum annual increase in emissions for any pollutant as compared to baseline emissions will be about 149 tons per year of nitrogen oxides within the Southwestern Oklahoma Intrastate Air Quality Control Region. The cumulative emissions of all pollutants will be less than 250 tons per year; therefore, cumulative emissions will not be considered regionally significant. Altus AFB is located in an area classified as attainment or unclassified for all criteria pollutants. Therefore, the proposed action is not subject to the de minimis and conformity determination requirements of the US Environmental Protection Agency Final Conformity Rule as defined in 40 CFR 93.153. Additionally, the proposed construction projects will comply with the Oklahoma State Implementation Plan. Any impacts will not be significant, but will be minor, both individually and collectively.

Earth Resources. Construction activities at Altus AFB will require limited soil disturbances. No impacts to geology from the proposed action or foreseeable actions are expected at any of the project locations. The projects will not impact prime farmland. Additionally there will be an impact regarding an increase of soil erosion; however, the erosion is minor and temporary in nature. Overall, impacts will not be significant.

Water Resources. Approximately 11 acres of impervious (impenetrable) cover will be added from the construction of the proposed facilities. This will increase the total amount of impervious cover at Altus AFB by 1.1 percent and result in a minimal increase in storm water runoff. Approximately 26 acres of impervious cover would be added from the ongoing actions at Sooner DZ. There will also be an effect cumulatively on soil erosion as a result of the other proposed projects in the Region of Influence. However, this effect is still minor and the impacts to water resources will not be significant.

Hazardous Materials. Hazardous materials will be used and hazardous waste will be generated as a result of the beddown of additional C-17 aircraft. These increases would not result in additional regulatory requirements for Altus AFB. It is not anticipated that asbestos and lead-based paint will be encountered during the construction and demolition. However, if necessary, asbestos and lead-based paint will be managed separately from the rest of the construction waste materials. A contractor trained in the disposal and management of this special waste will be used to perform this work. If encountered, the asbestos and lead-based paint removal will be managed and disposed according to the Altus AFB's *Lead-Based Paint Management Plan*, *Asbestos Management Plan*, and the *Asbestos Operations Plan*. No significant impacts are expected.

Biological Resources. Construction activities will occur within previously disturbed portions of Altus AFB. No endangered or threatened species (or critical habitat) have been identified near Altus AFB and no significant impact upon biological resources will occur as a result of this project. The construction activities associated with the proposed action will not occur in floodplain or wetland areas. Cumulative impacts, if any, will not be significant.

Cultural Resources. No potentially eligible historic sites will be impacted during construction activities. Therefore, the proposed action will have no significant effect on listed or eligible cultural resources.

Infrastructure and Utilities. Wastewater generation and potable water consumption would increase; however, increases will be within the designed capacities of each system. Impervious cover would increase at Altus AFB resulting in increased stormwater runoff. Increase in solid waste generated will be within the capacity of the Altus Landfill. Increased number of vehicles would pass through the main gate each day. Impacts will not be significant.

Socioeconomic Resources. Construction personnel needed for the proposed projects will be drawn from the current labor force in Jackson County. Jackson County has experienced a steady population decline (1.1 percent or approximately 316 people) since 1990. The proposed increase in personnel will off-set this decline. There will be no impact on the schools in Jackson County. The proposed construction activities will be in line with previous years construction budgets and not expected to generate large economic benefits for the local community.

ENVIRONMENTAL JUSTICE: Activities associates with the proposed action will not impose adverse environmental effects on adjacent populations. Therefore, no disproportionately high and adverse effects will occur to minority populations or low-income populations.

ALTERNATIVE ACTION: The alternative action is similar to the proposed action, except the construction of an Assault Landing Zone (ALZ) is proposed at one of four candidate locations. Under the alternative action, C-17 aircraft would use the same transition fields that are currently used by Altus AFB. However, transition fields would be used at a higher rate than current C-17 use. At Sooner DZ, no significant impacts were identified for the topics analyzed. Specifically, noise, air quality, earth resources, water resources, hazardous materials, and transportation will experience slight impacts. Impacts to biological resources would not occur. A slight benefit to socioeconomics will occur through the construction of facilities. Should Sooner ALZ Site 1 or 2 be selected, the Air Force will consult with the State Historic Preservation Officer to avoid an effect on cultural resources.

At CSIA, no significant impacts were identified for the topics analyzed. Specifically, noise, air quality, earth resources, water resources, hazardous materials, and transportation will experience slight impacts. Impacts to biological resources would not occur. A slight benefit to socioeconomics will occur through the construction of facilities. Consultation with the State Historic Preservation Officer has indicated no archeological resources are extant at CSIA.

At Amarillo IAP, beneficial impacts to noise and air quality will occur. About 900 acres of land exposed to elevated noise levels (greater than 65dBA) will be eliminated under the alternative action. In addition, air pollutant emissions will be reduced within the region.

At Lubbock IAP, there would be no change from baseline conditions with respect to noise. Air pollutant emissions will be reduced within the region.

NO-ACTION ALTERNATIVE: As the beddown of up to eight additional C-17 aircraft would not occur at Altus AFB, the conditions and characteristics anticipated under the no-action alternative for each of the biophysical resources will continue at levels equal to those occurring under the existing condition. No significant environmental impacts are experienced or generated by the existing condition. Likewise, no environmental regulations are violated by

the existing operating procedures. Therefore, no significant impacts would be expected for the no-action alternative. However, implementation of the no-action alternative will not meet the objectives of the proposal and the Air Force would not be able to provide required C-17 aircrew training.

DECISION: Based on my review of the facts and analysis contained in the attached environmental assessment, I conclude the implementation of the proposed action will not produce any significant direct, indirect, or cumulative impact. Accordingly, the requirements of the National Environmental Policy Act, regulations promulgated by the President's Council on Environmental Quality, and Air Force Instruction 32-7061 are fulfilled and an environmental impact statement is not required.

19 AUG 04

DAVID R. MILLER, Colonel, USAF
Chairperson, Environmental Protection Committee
Altus Air Force Base, Oklahoma

Date

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ACRONYMS AND ABBREVIATIONS

97 AMW	97^{th} Air Mobility Wing	GSE	ground support equipment
AAF	Army Air Field	HQ	Headquarters
ACHP	Advisory Council on Historic Preservation	Hr	hour
AETC	Air Education and Training Command	Hz	Hertz
AFB	Air Force Base	IAP	International Airport
AFI	Air Force Instruction	IFR	Instrument Flight Rules
AGL	above ground level	IR	Instrument Rules
ALZ	Assault Landing Zone	IRP	Installation Restoration Program
AMC	Air Mobility Command	KVA	kiloVolt-amperes
AMU	Aircraft Maintenance Unit	kW	kiloWatt
AMW	Air Mobility Wing	kWH	kiloWatt-hours
AQCR	Air Quality Control Region	L_{dn}	day-night average sound level
ARC	Air Reserve Component	L_{dnmr}	Onset-rate adjusted monthly day-night average sound level
ARTCC	Air Route Traffic Control Center	L_{eq}	Equivalent sound levels
BASH	Bird-Aircraft Strike Hazard	L_{max}	Maximum sound level
bgs	below ground surface	L_p	sound pressure level
CAA	Clean Air Act	lb/ft^3	pounds per cubic foot
CE	Civil Engineer	MAILS	Multiple-Aircraft Instantaneous Line Source
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act	MFH	military family housing
CEQ	Council on Environmental Quality	mg/L	milligrams per liter
CFR	Code of Federal Regulations	mgd	million gallons per day
CO	carbon monoxide	MHz	Megahertz
CRMP	Cultural Resources Management Plan	MPD	Mobility Pilot Development
CSIA	Clinton-Sherman Industrial Airpark	msl	mean sea level
CWA	Clean Water Act	MTR	Military Training Route
DASR	Digital Airport Surveillance Radar	NAAQS	National Ambient Air Quality Standards
dB	Decibel	NAGPRA	Native American Graves Protection and Repatriation Act
dBA	A-weighted sound levels	NAS	Naval Air Station
DNL	day-night average A-weighted sound levels	NEPA	National Environmental Policy Act
DoD	Department of Defense	NFIP	National Flood Insurance Program
DoDD	Department of Defense Directive	NHPA	National Historic Preservation Act
DRAS	dual row airdrop system	NO_2	nitrogen dioxide
DZ	Drop Zone	NO_x	nitrogen oxides
EA	Environmental Assessment	NRCS	Natural Resource Conservation Service
EDMS	Emissions and Dispersion Modeling System	NVG	Night Vision Goggle
EIAP	Environmental Impact Analysis Process	O_3	Ozone
EIS	Environmental Impact Statement	OAS	Oklahoma Archeological Survey
EO	Executive Order	OBS	Oklahoma Biological Survey
ºF	Fahrenheit	ODEQ	Oklahoma Department of Environmental Quality
FAA	Federal Aviation Administration	ODWC	Oklahoma Department of Wildlife Conservation
FEMA	Federal Emergency Management Agency	OSHA	Occupational Safety and Health Administration
FONSI	Finding of No Significant Impact	OSIDA	Oklahoma Space Industry Development Authority
FPPA	Farmland Protection Policy Act	PI	point of impact
FTS	Flight Test Squadron	$PM_{2.5}$	particulate matter less than 2.5 micrometers in diameter
FTU	Formal Training Unit	PM_{10}	particulate matter less than 10 micrometers in diameter
FY	fiscal year	ppm	parts per million

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PSD	Prevention of Significant Deterioration
RAPCON	radar approach control
ROI	region of influence
SAC	Strategic Air Command
SEL	sound exposure level
sf	square feet
SFHA	Special Flood Hazard Area
SHPA	State Historic Preservation Officer
SO_2	sulfur oxides
SO_x	sulfur dioxide
SR	Slow Route
SUPT	Specialized Undergraduate Pilot Training
SWODA	Southwestern Oklahoma Development Authority
SWPPP	Storm Water Pollution Prevention Plan
sy	square yards
tpy	tons per year
$\mu g/m^3$	Micrograms per cubic meter
US	United States
USACE	United States Army Corps of Engineers
USC	United States Code
USCB	United States Census Bureau
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VFR	Visual Flight Rules
VOCs	volatile organic compounds
VR	Visual Rules
WWTP	Wastewater Treatment Plant

FINAL

Environmental Assessment

C-17 Program Changes
Altus Air Force Base, Oklahoma

Department of the Air Force
97th Air Mobility Wing
Altus Air Force Base, Oklahoma

July 2004

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COVER SHEET

Responsible Agency: Department of the Air Force, 97th Air Mobility Wing, Altus Air Force Base (AFB), Oklahoma.

Cooperating Agency: Federal Aviation Administration, Doug Graham, FAA Headquarters, AST-100, 800 Independence Ave., Room 331, Washington, D.C., 20591, (202) 267-8568.

Proposed Action: C-17 Program Changes; Altus AFB, Jackson County, Oklahoma; Clinton-Sherman Industrial Airpark, Washita County, Oklahoma; Sooner Drop Zone vicinity, Harmon County, Oklahoma; and military training routes located in Beckham, Greer, Harmon, Jackson, Kiowa, Roger Mills, Tillman, and Washita Counties, Oklahoma; and Archer, Armstrong, Baylor, Biscoe, Childress, Collingsworth, Cottie, Crosby, Dickens, Donley, Fisher, Floyd, Foard, Barza, Gray, Hall, Hardeman, Hemphill, Jack, Kent, Motley, Stonewall, Wheeler, and Wilbarger Counties, Texas.

Point of Contact: James Bellon, 97 CES/CEV, 401 L Avenue, Altus AFB, Oklahoma, 73523-5138, (580) 481-7606.

Report Designation: Final Environmental Assessment (EA)

Abstract: The proposed action includes the beddown of up to eight additional C-17 aircraft at Altus Air Force Base (AFB), Oklhoma. In addition, by the end of Fiscal Year 2007, all C-5 aircraft, associated manpower, support, and equipment would be transferred from Altus. Existing C-5 facilities would be converted to C-17 use and new C-17 facilities would be constructed. Furthermore, KC-135 transition training would be accomplished at other airfields. Altus AFB C-17 aircrews would accomplish low-level navigation training on 14 existing Military Training Routes that are scheduled and coordinated by Air Force, Navy, and Air National Guard units at other Air Force bases and military installations in Oklahoma and Texas. C-17 aircraft would use the same transition airfields that are currently used by Altus AFB. However, the transition airfields would be used at a higher rate than the current C-17 utilization. To accommodate the increased utilization rate of the ALZ due to the additional C-17s, the KC-135 transition training would be decreased at Altus AFB with a corresponding increase at other transition locations (proposed action). As an alternative, Altus AFB could construct an Assault Landing Zone (ALZ) at one of four candidate locations. C-17 aircraft would use the same transition fields that are currently used by Altus AFB. However, transition fields would be used at a higher rate than current C-17 use. Conversely, the Air Force could elect to take no action (no-action alternative). The following biophysical resources were identified for study at Altus AFB, Sooner Drop Zone, Clinton-Sherman Industrial Airpark, Amarillo International Airport (IAP), and Lubbock IAP: noise, air quality, earth resources, water resources, hazardous materials, biological resources, cultural resources, socioeconomics, and infrastructure/utilities, as applicable.

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CHAPTER 1

PURPOSE OF AND NEED FOR ACTION

The Air Force proposes to add up to eight additional C-17 aircraft to the existing inventory of aircraft at Altus Air Force Base (AFB). This environmental assessment (EA) consists of seven chapters covering the purpose and need for action, a detailed description of the proposed action and alternatives, environmental baseline, environmental analysis, list of preparers, list of agencies contacted, and the references used to develop this assessment. This chapter presents the purpose of and need for action, a description of the location, description of the scope of the environmental review, an overview of environmental requirements, and an introduction to the organization of this document.

1.1 PURPOSE OF AND NEED FOR ACTION

Altus AFB, an Air Education and Training Command (AETC) installation, is an Air Force Air Mobility Training Center for pilots, navigators, flight engineers, loadmasters, and boom operators. As such, the mission of the 97th Air Mobility Wing (97 AMW), the host unit at Altus AFB, is formal strategic airlift and aerial refueling flying training in C-5, C-17, and KC-135 aircraft for Air Force, Air Force Reserve Command, and Air National Guard units. The base also serves as the aerial port of embarkation for the US Army, and the Air Force. Approximately 333 of the 97 AMW's training instructors are combat-ready aircrew members who are prepared, when needed, for immediate worldwide deployment to support the National Military Strategy by accomplishing air refueling, airlift, and airdrop missions.

The Air Force established C-17 academic and simulator training beginning in fiscal year (FY) 1995 and flying training beginning in FY 96. By 2002, the Air Force assigned a total of 10 C-17 aircraft to Altus AFB. The C-17 aircraft combines the attributes of a strategic airlifter [i.e., long range, aerial refueling, and large payload (including outsize cargo)] with those of a tactical airlifter (i.e., agility in the air, survivability, ability to operate on austere airfields with short runways), and the ability to air drop cargo and personnel. A key capability of the C-17 aircraft is that it can land at and take off from short, narrow runways called assault landing zones (ALZ) (5,000 feet or less in length by 90 to 100 feet in width).

The Air Force Mobility Force Structure Briefing to Congress on April 15, 2002 presented an airlift mobility transformation plan (the Plan) that proposes to standardize airlift aircraft fleets, increase reliability, lower operating and support costs, and increase airlift capability by 33 percent (%). The National Military Strategy requires the ability to airlift 54.5 million ton miles per day, while the current capability is 45.8 million ton miles per day. The Plan, which extends through the year 2017, would allow the Air Force to address the increasing demand for airlift with newer, more reliable aircraft and improved overall support, by:

- Retiring C-141 aircraft;
- Acquiring additional C-17s over the next 10 years to replace the C-141s; and
- Realigning additional C-5s to the Air Reserve Component (ARC) and modernizing the aircraft.

In 2002, Congress authorized the acquisition of additional C-17s. Expected delivery of C-17 aircraft to Altus AFB is between 2004 and 2010. Also, in February 2002, the AMC Mobility Training Steering Group met to discuss the mobility pilot's progression from the Formal Training Unit (FTU) to Aircraft Commander Upgrade. They determined that they were not capitalizing and building on the skills taught during the Specialized Undergraduate Pilot Training (SUPT) program. They also determined that pilots took too long achieving Mission Ready status after arriving at the unit and spent too much time at the FTU for follow-on upgrade training. As a result, AMC requested that AETC help develop a "Mobility Pilot Development" (MPD) program that would produce a Mission Ready pilot capable of operating their aircraft from either seat, eliminating the need to return for aircraft commander upgrade training.

Due to the anticipated corresponding increases in inventory at Altus AFB, the Air Force requires additional C-17 Formal Training Unit support in order to meet the additional training requirements. However, current aircraft operations at Altus AFB are at maximum capacity. Based on current pattern saturation (i.e. maximum number of aircraft in the pattern), if Altus AFB received additional C-17 aircraft, it would be unable to support an increase in flying training activities without substantial modifications to current support facilities and operating procedures.

1.2 LOCATION

Altus AFB is located in Jackson County in southwestern Oklahoma, approximately 140 miles southwest of Oklahoma City, Oklahoma. Altus AFB aircrews also conduct aircraft training operations at the Sooner Drop Zone (DZ), and Clinton-Sherman Industrial Airpark (CSIA) as depicted on Figure 1-1.

Altus AFB conducts transition training (See Section 2.1) at Amarillo International Airport (IAP), Amarillo, Texas; Midland IAP, Midland, Texas; Lubbock IAP, Lubbock, Texas; McConnell AFB, Kansas; and Tinker AFB, Oklahoma. Under the proposed action, transition training could be added at Fort Worth Naval Air Station (NAS), Texas, and Robert Gray Army Air Field (AAF), Texas. The locations of transition training airfields are presented on Figure 1-2. In addition, locations of military training routes (MTRs) are depicted on Figure 1-3.

1.3 SCOPE OF THE ENVIRONMENTAL REVIEW

The *National Environmental Policy Act* (NEPA) of 1969, as amended, requires federal agencies to consider environmental consequences in the decision-making process. The President's Council on Environmental Quality (CEQ) issued regulations to implement NEPA that include provisions for both the content and procedural aspects of the required EA as found in Title 40 Code of Federal Regulations (CFR) Sections 1500-1508. The Air Force Environmental

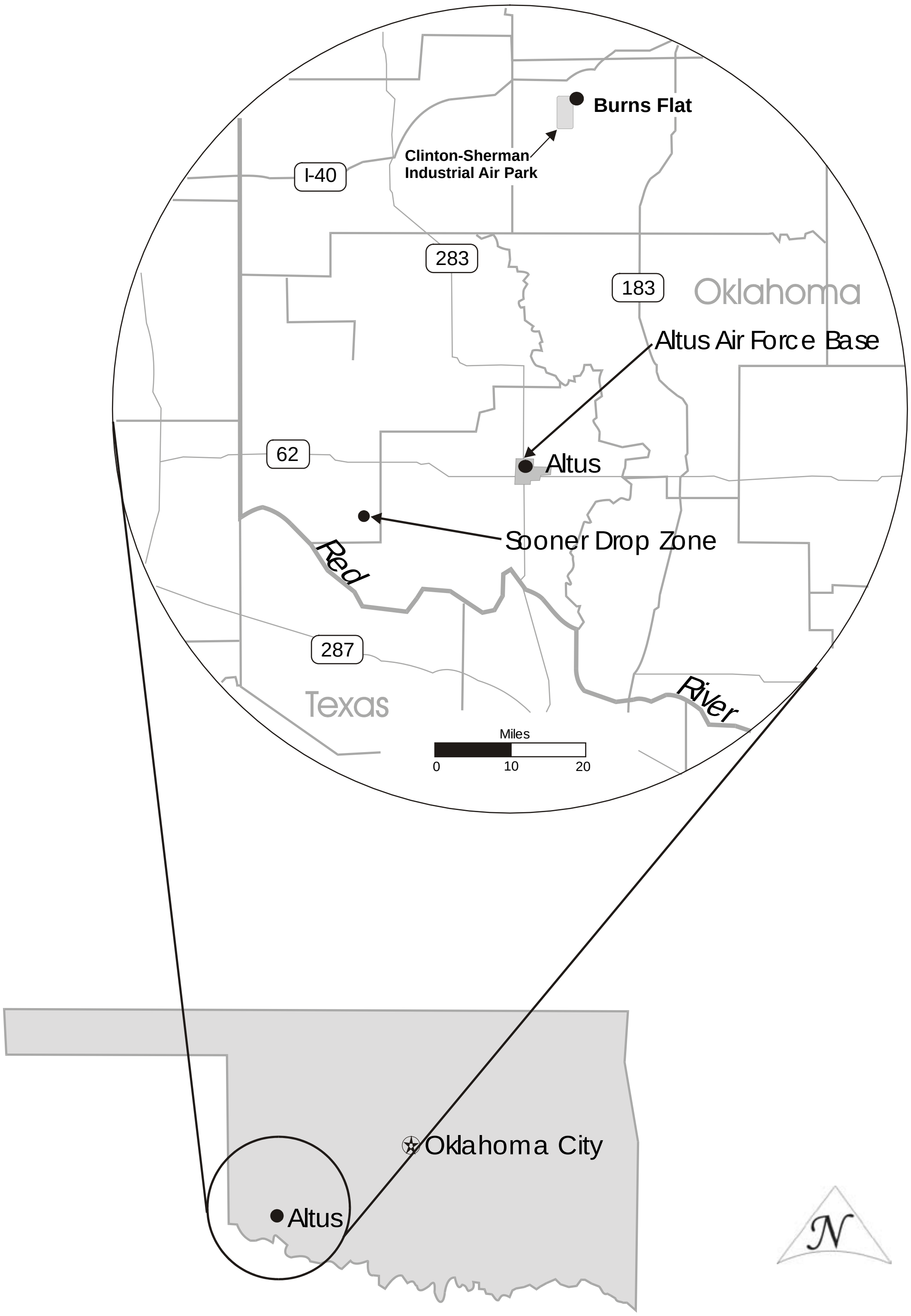


Figure 1-1 Regional Location Map

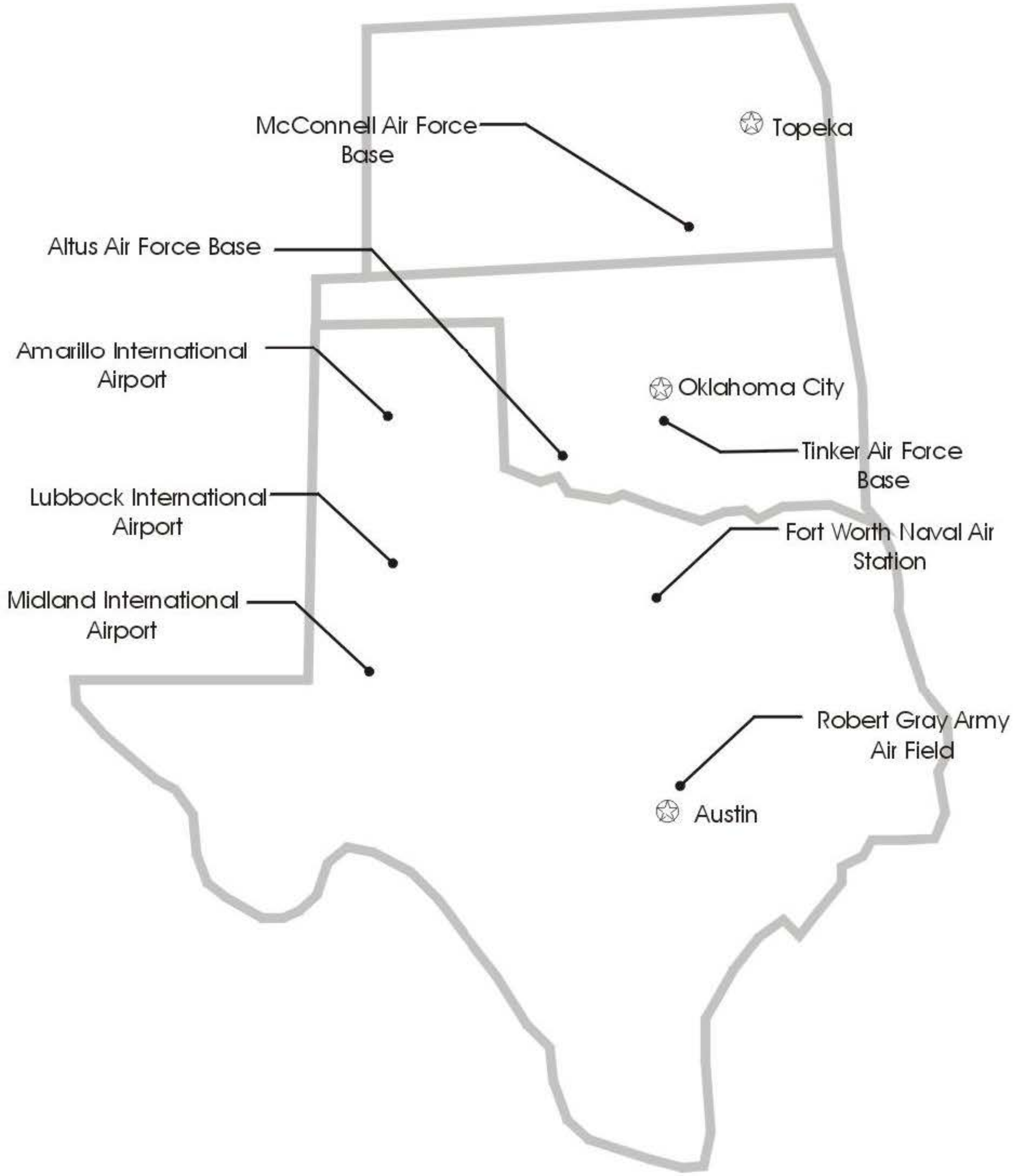


Figure 1-2 Transition Training Airfield Locations

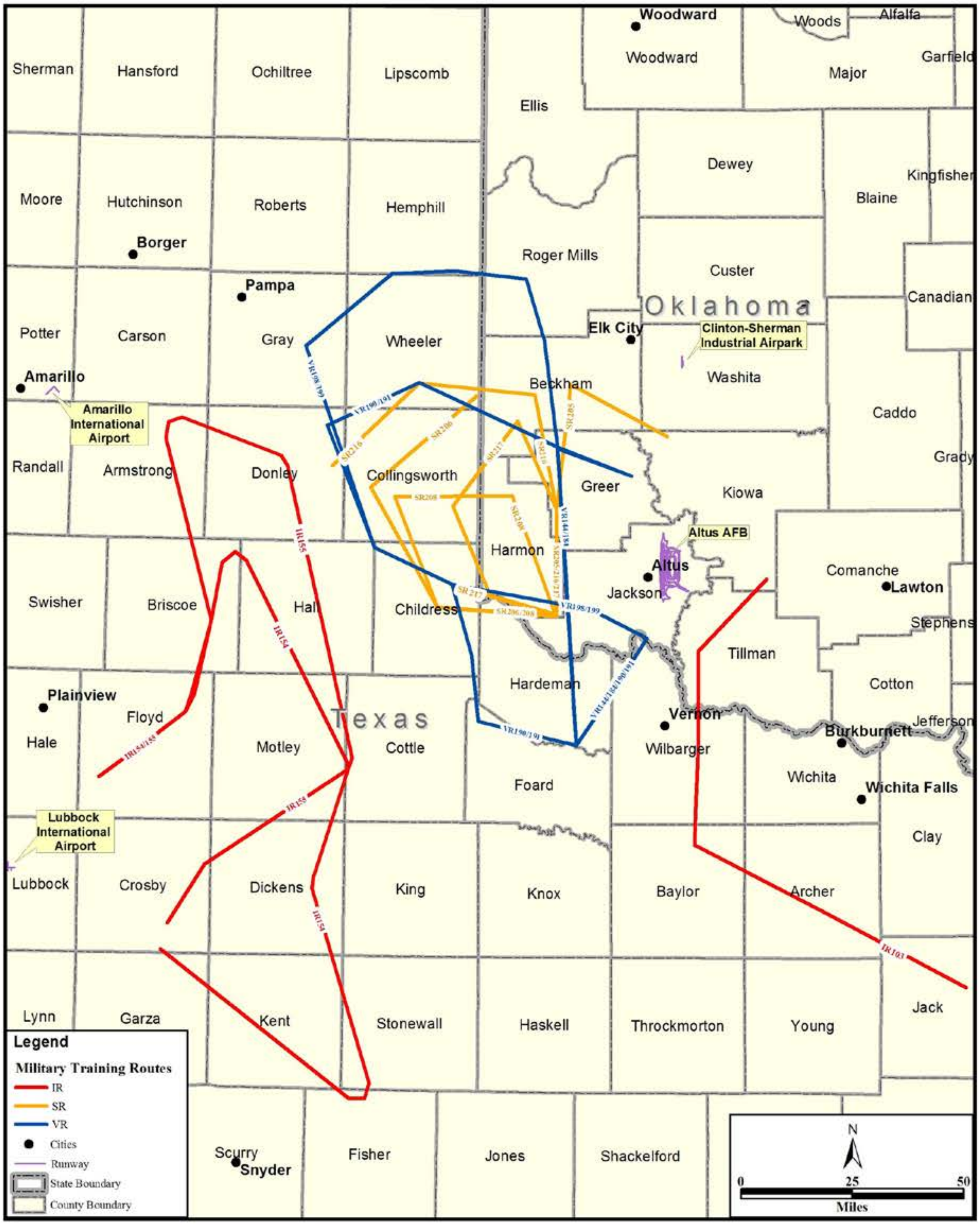


Figure 1-3 Military Training Routes

Impact Analysis Process (EIAP) is accomplished through adherence to the procedures set forth in Air Force Instruction (AFI) 32-7061, *The Environmental Impact Analysis Process*, 12 March 2003, and 32 CFR 989, *Environmental Impact Analysis Process*, which establish both the administrative process and substantive scope of the environmental impact evaluation designed to ensure that deciding authorities have a proper understanding of the potential environmental consequences of a contemplated course of action. The CEQ regulations require that an EA:

- Provide sufficient evidence and analysis for determining whether to prepare an Environmental Impact Statement (EIS) or a Finding of No Significant Impact (FONSI).
- Facilitate the preparation of an EIS, when required.

This EA assesses the proposed C-17 program changes. This EA identifies, describes, and evaluates the potential environmental impacts that may result from implementation of the proposed action or alternative actions as well as possible cumulative impacts. This EA also will also address the real estate interests (fee/easement/mineral rights) to be acquired and environmental permits relevant to the proposed action and alternative actions. As appropriate, the affected environment and environmental consequences of the proposed action, alternative actions, and no action alternative are described in terms of site-specific descriptions or regional overview. Finally, the EA identifies mitigation measures to prevent or minimize environmental impacts, if required.

The following biophysical (combined biological and physical) resources were identified for study at Altus AFB, Sooner DZ vicinity, and CSIA: noise, air quality, earth resources, water resources, hazardous materials and wastes, biological resources, cultural resources, socioeconomic resources, and land use. Additionally, infrastructure and utilities are assessed at Altus AFB; however, due to the absence of ground-based activities and personnel changes, minor increases in infrastructure and utilities demands (including relocation of utilities) at Sooner DZ vicinity and CSIA associated with ALZ operation would be well within existing system capacities. Therefore, an assessment of these resource specific areas to solid waste management, electricity and natural gas, sanitary sewer, and potable water are not included in this document.

Airspace, and the management of this resource involve the direction, control, and handling of flight operations in the volume of air that overlies the geopolitical borders of the United States and its territories. Airspace is a resource managed by the Federal Aviation Administration (FAA), which has established policies, designations, and flight rules to protect aircraft in the airfield and enroute environment, in Special Use Airspace areas identified for military and other governmental activities, and other military training airspace. No aspects of the proposals assessed in this document involve airspace modifications that would require rule-making actions by the FAA. Therefore, there is no potential for specific impacts to this resource.

Assessment of safety and health impacts are not included in this document; all contractors would be responsible for compliance with applicable Occupational Safety and Health Act (OSHA) regulations concerning occupational hazards and specifying appropriate protective measures for all employees.

The proposal also includes C-17 flying activities at: Amarillo IAP and Lubbock IAP. Analysis of operations at these airports will be limited to air quality, noise, and protection of childern. Analysis of the remaining resource areas are not necessary due to the absence of ground-based activities at the airports and no changes in personnel at these locations.

Transition training for KC-135 aircraft is proposed at Amarillo IAP; Lubbock IAP; CSIA; McConnell AFB, Kansas; Tinker AFB, Oklahoma. In addition, transition training would be added at Fort Worth NAS, Texas, and Robert Gray AAF, Texas. This EA addresses transition training at Amarillo and Lubbock IAPs and CSIA. KC-135 transition training at other locations was evaluations and assessed in a 1994 NEPA action, *KC-135 Combat Crew Training School Relocation, Altus Air Force Base, Oklahoma*. Therefore, the impacts associated with KC-135 transition training at these locations are not assessed in this study.

Executive Order (EO) 12898, *Federal Action to Address Environmental Justice in Minority Populations and Low-Income Populations*, was issued by the president on February 11, 1994. In the EO, the president instructed each Federal agency to make "achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. Adverse is defined by the Federal Interagency Working Group on Environmental Justice as “having a deleterious effect on human health or the environment that is significant, unacceptable, or above generally accepted norms.” Based on analysis of impacts in this EA, a determination on significance of impacts will be made in a Finding of No Significant Impact. If impacts would be significant, the Air Force would either prepare an EIS or not implement the proposal. Accordingly, Environmental Justice will be addressed either in a FONSI (after determination on significance of impacts) or in a Record of Decision based on an EIS.

The affected environment as presented in the *Environmental Impact Statement for Proposed Airfield Repairs, Improvements, and Adjustments to Aircrew Training for Altus AFB*, May 2002, was used to establish the baseline conditions for Altus AFB. The affected environment in the *Environmental Assessment, Slow Routes and Instrument Routes, Altus Air Force Base, Oklahoma*, February 1996, was used to establish the baseline conditions for the MTRs. Also, the *Sooner Drop Zone Expansion, Environmental Assessment, Altus Air Force Base, Oklahoma*, June 2003, was used to establish the baseline conditions for the Sooner DZ vicinity. This EA addresses specific peak operational impacts and expected long-term impacts expected for the proposed and alternative actions.

Other actions or potential actions that may be concurrent with the proposed action within the ROI could contribute to cumulative impacts. The environmental impacts of these other actions are addressed in this EA only in the context of potential cumulative impacts, if any. A cumulative impact, as defined by the CEQ (40 CFR 1508.7), is the “impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of which agency (federal or non-federal) or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.”

1.4 APPLICABLE REGULATORY REQUIREMENTS

Regulatory requirements potentially applicable to the proposed action and alternatives are presented in Table 1-1.

1.5 INTRODUCTION TO THE ORGANIZATION OF THE DOCUMENT

This EA is organized into seven chapters. Chapter 1 contains a statement of the purpose of and need for action, the location of the proposed action, a statement of the decision to be made and identification of the decision maker, a summary of the scope of the environmental review, identification of applicable regulatory requirements, and a description of the organization of the EA. Chapter 2 contains a brief introduction, a description of the history of the formation of alternatives, describes the alternatives eliminated from further consideration, provides a detailed description of the proposed action, identifies other action alternatives, summarizes other actions announced for Altus AFB, provides a comparison matrix of environmental effects for all alternatives, identifies the preferred alternative, and identifies mitigation requirements, if required. Chapter 3 contains a general description of the biophysical resources that potentially could be affected by the proposed action or alternatives. Chapter 4 is an analysis of the environmental consequences. Chapter 5 lists preparers of this document. Chapter 6 lists persons and agencies consulted in the preparation of this EA. Chapter 7 is a list of source documents relevant to the preparation of this EA.

Additional technical information on the methodology and concept of noise measurement and modeling, as well as data on noise effects, are provided in Appendix A. Appendix B contains documentation relevant to interagency and intergovernmental coordination and Appendix C contains detailed air pollutant emission calculations. A summary of the public comments and government responses, if applicable, are provided in Appendix D.

Table 1-1 Potentially Required Federal Permit, License, or Entitlement

Federal Permit, License, or Entitlement	Typical Activity, Facility, or Category of Persons Required to Obtain the Federal Permit, License, or Entitlement	Authority	Regulatory Agency
Title V permit under the Clean Air Act (CAA)	Sources subject to the Title V permit program include: Any major source: (1) A stationary source that emits or has the potential to emit 100 tons per year (tpy) of any pollutant (major source threshold can be lower in nonattainment areas), (2) A major source of air toxics regulated under Section 112 of Title III (sources that emit or have the potential to emit 10 tpy or more of a hazardous air pollutant or 25 tpy or more of any combination of hazardous air pollutants). Any "affected source" as defined in Title IV (acid rain) of the CAA. Any source subject to New Source Performance Standards under Section 111 of the CAA. Sources required to have new source or modification permits under Parts C {Prevention of Significant Deterioration (attainment areas)} or D {New Source Review (nonattainment areas)} of Title I of the CAA. Any source subject to standards, limitations, or other requirements under Section 112 of the CAA. Other sources designated by US Environmental Protection Agency (USEPA) in the regulations.	Title V of CAA, as amended by the 1990 CAA Amendments	USEPA; Oklahoma Department of Environmental Quality (ODEQ)
National Pollutant Discharge Elimination System permit	Discharge of pollutant from any point source into navigable waters of the United States.	§ 402 of Clean Water Act (CWA); 33 United States Code (USC), §1342	USEPA; ODEQ
National Historic Preservation Act consultation	Excavation and/or removal of archaeological resources from public lands or Indian lands and carrying out activities associated with such excavation and/or removal.	National Historic Preservation Act, § 106	US Department of the Interior - National Park Service, Oklahoma Historical Society

Table 1-1, Continued

Federal Permit, License, or Entitlement	Typical Activity, Facility, or Category of Persons Required to Obtain the Federal Permit, License, or Entitlement	Authority	Regulatory Agency
Endangered Species Act § 7 consultation	Taking endangered or threatened wildlife species; engaging in certain commercial trade of endangered or threatened plants or removing such plants on property subject to federal jurisdiction.	§ 7 of Endangered Species Act, 16 USC § 1539; 50 CFR 17 Subparts C, D, F, and G	US Department of the Interior - Fish and Wildlife Service (USFWS)
Clean Water Act § 404 permit	Actions to reduce the risk of flood loss to minimize the impact of floods on human safety, health, and welfare; to restore and preserve the natural and beneficial values served by floodplains; actions to minimize destruction, loss, or degradation of wetlands; and to preserve and enhance the natural and beneficial values of wetlands.	Executive Orders (EOs) 11988 and 11990, § 404 of CWA, 33 USC § 1251	US Army Corps of Engineers, USFWS

CHAPTER 2

DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

2.1 INTRODUCTION

This chapter is composed of nine sections: an introduction, a brief history of the formulation of alternatives to the proposed action, identification of alternatives eliminated from further consideration, a detailed description of the proposed action, a description of the no-action alternative, a detailed description of other alternative actions, identification of other actions, a summary of environmental impacts of all alternatives, and identification of mitigative actions, if applicable.

Throughout this document, three terms are used to describe flying operations: sortie, airfield operation, and sortie operation. Each has a distinct meaning commonly applied to a specific set of activities in particular airspace areas.

- A sortie is a single military aircraft flight from initial takeoff through final landing.
- An airfield operation is the single movement or individual portion of a flight in the airfield airspace environment, such as one departure (takeoff), one arrival (landing), or one transit of the airport traffic area. The airfield airspace environment typically is referred to as the airspace allocated to the air traffic control tower and includes the airspace within an approximate 5-mile radius of the airfield and up to 2,500 feet above ground level (AGL). For example: a low approach or a missed approach consists of two airfield operations, i.e., one arrival and one departure. A closed pattern consists of two airfield operations (i.e., one takeoff and one landing accomplished as a touch and go). The minimum number of airfield operations for one sortie is two operations, one takeoff (departure) and one landing (arrival).
- A sortie aircraft operation is defined as the use of one airspace unit [e.g., military operations area, restricted area, MTR, or radar approach control airspace (RAPCON)] by one aircraft. A sortie aircraft operation applies to flight activities outside the airfield airspace environment. Each time a single aircraft conducting a sortie operates in a different airspace unit, one sortie operation is counted for that unit.

The term "transition training" indicates a period of time scheduled into a sortie, at a specific airfield, for the purpose of training (or practicing) normal (and emergency) visual and instrument approaches and landings. It may include missed approaches, low approaches, touch and gos, refused (aborted) landings, and full stop landings.

2.2 HISTORY OF THE FORMULATION OF ALTERNATIVES

2.2.1 Alternative Selection Criteria

The factors considered when developing the alternatives were based on the operational requirements of Altus AFB associated with supporting up to 8 additional C-17 aircraft. Training at Altus AFB would need to be adjusted to accommodate the increased training requirements on the existing ALZ. Due to the configuration of the runways, only the instrument runway and either the ALZ or the east runway can be used simultaneously. Because additional C-17 aircraft would increase pattern saturation (i.e., limitations in the number of aircraft in the pattern at any time), other Altus AFB aircraft need to conduct transition training at additional locations. Therefore, selection criteria were based on the following considerations:

- Conducting transition training and ALZ training at airfields within 350 miles of Altus AFB minimizing operational costs.
- Identification of an existing airfield requiring minimal airfield repairs and upgrades which could serve as an ALZ.
- Address deterioration of existing ALZ at Altus AFB and conduct airfield repairs and improvements while retaining the pilot training schedule.
- Ability to conduct high speed and tactical high-low ingress-egress training at an ALZ.

2.2.2 Development of Alternatives

Based on the selection criteria presented in Section 2.2.1, the following general alternative concepts were developed:

- Increase the amount of KC-135 transition training conducted at alternate airfields, with C-17s utilizing existing ALZ at Altus AFB.
- Construction and operation of a new ALZ near Sooner DZ or CSIA for C-17s (KC-135 transition training to predominantly remain at Altus AFB).
- Conduct ALZ training operations at existing airfields or ALZs.

2.3 IDENTIFICATION OF ALTERNATIVES ELIMINATED FROM CONSIDERATION

Transition training alternatives focused on alleviating airspace saturation at Altus AFB. A portion of transition training is already conducted at other airfields; however, the relocation of 100 percent of transition training to alternate airfields would not be cost effective due to excessive aircraft fuel consumption and was eliminated from further consideration. The existing ALZ at Altus AFB is located between the parallel runways. Therefore, existing ALZ aircraft operations contribute to the airspace saturation problem. The utilization of a new ALZ would help alleviate the airspace saturation problems and allow transition training to remain at Altus AFB.

To limit operational costs, the Air Force researched military and civil airfields within a 350-mile radius of Altus AFB which could serve as an ALZ. Of those airfields identified, several were eliminated from further consideration based on the criteria established in Section 2.2.1. For example, Little Rock AFB, Arkansas, is not a feasible alternative due to near pattern saturation from C-130 operations and would not be able accommodate additional airfield operations. The airfield at the former Reese AFB, Texas, is a daytime only airfield and would not be able to support existing nighttime training requirements, including the planned NVG training. Mineral Wells Municipal Airport, Mineral Wells, Texas, runways and taxiways do not meet the minimum weight-bearing capabilities for C-17 operations and extensive repairs and upgrades would be required.

The Air Force also considered 14 other existing runways located outside the preferred 350-mile radius as potential ALZ sites. All locations were eliminated from further consideration due to extensive runway repair or improvement needed to meet the minimum ALZ criteria. In addition to the added facilities upgrades and aircraft fuel costs, the use of these airfields would require sharing of airspace with civilian air traffic, which posed potential scheduling conflicts and safety concerns. Therefore, the establishment of an ALZ at these locations was eliminated from further consideration.

With no existing airfields suitable for use as an ALZ, construction of a new ALZ in the vicinity of Altus AFB became the primary area of consideration. A new ALZ would satisfy all of the selection criteria and allow for transition training to remain at Altus AFB.

2.4 DETAILED DESCRIPTION OF THE PROPOSED ACTION

The Air Force proposes to add up to eight C-17 aircraft at Altus AFB. In addition, by FY 07, all C-5 aircraft, associated manpower, support, and equipment would be transferred from Altus. Existing C-5 facilities would be converted to C-17 use and new C-17 facilities would be constructed. Furthermore, KC-135 transition training would be accomplished at other airfields. The specifics of the proposed action are described in the sections below.

2.4.1 Aircraft and Operations

The Air Force proposes to increase the current inventory of 10 C-17 aircraft at Altus AFB to as many as 18 C-17 aircraft by FY 10 and implement the MPD program beginning in FY 05. In addition, by the end of FY 07 all C-5 aircraft and associated manpower, support, an equipment would be transferred from Altus AFB.

During the life cycle of the C-17 program changes, there would be a point when a maximum number of all three aircraft types (C-17, C-5, and KC-135) would be operating from Altus AFB. This is referred to as the “Peak-State” of operations. After FY 07, C-5 operations would be reduced until all C-5 operations at Altus AFB would cease. This period is referred to as the “End-State.” C-5 flying hours would remain at a steady state until the end of FY 06. During the drawdown year (FY 07), C-5 flying time would be reduced by approximately 50%. There would be no C-5 flying hours in FY 08. KC-135 flying hours will increase from 13,300 hours to 14,400 hours in FY 05 and remain steady until approximately FY 09 when it would drop to a

steady state of 12,000 hours per year. This drop will occur once all aircraft commander upgrades are complete.

2.4.2 Airspace

Altus AFB C-17 aircrews would accomplish low-level navigation training on 14 existing MTRs (Figure 1-3). There are three types of MTRs:

- Routes flown using **Instrument Flight Rules** (IFR) procedures (IR routes) allow aircraft to operate below 10,000 feet above mean sea level (msl) at speeds in excess of 250 knots (288 miles per hour) along Department of Defense (DoD)/FAA mutually developed and published routes in IFR conditions.

- Routes flown using **Visual Flight Rules** (VFR) procedures (VR routes) are guided by the same restrictions as IR routes but are limited to 3,000 feet AGL ceiling and 5 miles visibility.

- **Slow Routes** (SRs) are slow speed low altitude training routes that operate below 1,500 feet AGL at airspeeds of 250 knots or less.

Under the proposed action, there would be changes to the frequency of use for SRs, VRs, and IRs. The current and anticipated frequency of use for C-17 training for all routes is presented in Table 2-1. Night operations are presented in parentheses.

Table 2-1 C-17 Use of Military Training Routes, Proposed Action

Description	Current	FY 05
SR-205	1 (0)	30 (7)
SR-206	1 (0)	30 (7)
SR-208	1 (0)	30 (7)
SR-216	3 (1)	30 (7)
SR-217	55 (20)	83 (30)
VR-144	3 (2)	30 (7)
VR-184	33 (20)	50 (30)
VR-190	55 (20)	83 (30)
VR-191	6 (2)	30 (7)
VR-198	1 (0)	30 (7)
VR-199	1 (0)	30 (7)
IR-103	22 (0)	33 (7)
IR-154	2 (0)	30 (7)
IR-155	4 (0)	30 (7)

Note: Uses per month, number in parenthesis indicates night operations

2.4.3 Transition Training

C-17 aircraft would use the same transition airfields that are currently used by Altus AFB. However, the transition airfields would be used at a higher rate than the current C-17 utilization. To accommodate the increased utilization rate of the ALZ due to the additional C-17s, the KC-135 transition training would be decreased at Altus AFB with a corresponding increase at other transition locations. The operations at transition airfields are primarily for student training and instructor pilot currency/proficiency.

Currently, C-17 transition training is conducted at Midland IAP, Lubbock IAP, Amarillo IAP, and the CSIA. KC-135 transition training is regularly conducted at Amarillo IAP; Lubbock IAP; CSIA; McConnell AFB, Kansas; Will Rogers World Airport, Oklahoma City, Oklahoma; and Tinker AFB, Oklahoma. Under the proposed action, Fort Worth NAS, Texas, and Robert Gray AAF, Texas, would be added to help accommodate the KC-135 training requirements. C-17 and KC-135 transition training is also conducted at Altus AFB.

Training events during C-17 and KC-135 transition training include instrument approaches, touch-and-go landings, full stop landings, and simulated engine out procedures. C-17 transition periods are usually scheduled in 2 to 2½ hour segments with the time evenly split between instrument work and visual approaches. During instrument training, an approach to the runway will occur approximately every 12 to 15 minutes. During visual work, an approach to the runway will occur about every six to eight minutes.

Airfield utilization under the proposed action associated with peak-state conditions is presented in Table 2-2 (with night operations presented in parentheses). Table 2-3 presents airfield utilization under end-state conditions (night operations in parentheses).

2.4.4 Student Loads and Manpower

The proposed beddown of additional C-17 aircraft would increase the average daily student loads (ADSLs) and have a corresponding increase in manpower to support C-17 activities. These increases would be offset through the elimination of most C-5 training by FY 08. The maximum ADSL would occur between FY 05 and FY 07, prior to the completion of the transition of C-5 aircraft from Altus AFB. In FY 08, the only C-5 training to remain at Altus AFB would be a Basic Flight Engineer (BFE) Course (no associated flying activities). ADSL projections for Altus AFB are presented in Table 2-4.

The beddown of additional C-17 aircraft would be supported by the addition of staff to the existing Operations Support Squadron (OSS) at Altus AFB. Specifically, three officers, 28 enlisted, and one civilian would be added to the OSS for operations data management, operations support, aerial operations support, and fuels by FY 05. Boeing Aircrew Training Systems technical representatives would also increase to support additional C-17 aircraft. Additional manpower increases beginning in FY 05 associated with the proposed C-17 beddown are presented in Table 2-5. The Most Efficient Organization represents the maximum authorized personnel strength level.

Table 2-2 Annual Closed Pattern Operations at Transition Airfields, Peak-State, Proposed Action

Aircraft	Event	Amarillo	Midland	Lubbock	Clinton-Sherman	Will Rogers	Fort Worth	Robert Gray	Lackland	McConnell	Tinker	Altus	Sooner
C-17	Arrival											4786 (2378)	
	Departure											5248 (1916)	
	VFR	1616 (628)	202 (79)	202 (79)								16086 (6323)	
	IFR	393 (153)	50 (20)	49 (19)								4424 (1721)	
	DZ Ops												2700 (900)
C-5	Arrival											1234 (198)	
	Departure											1432 (0)	
	VFR	1411 (22)	705 (11)		2116 (0)			1411 (22)	705 (10)			705 (10)	
	IFR	852 (8)	426 (4)		1278 (0)			852 (8)	426 (4)			426 (4)	
KC-135	Arrival											2478 (546)	
	Departure											3024 (0)	
	VFR	1982 (437)	992 (219)		1982 (0)	992 (219)	992 (219)			992 (219)	992 (219)	992 (219)	
	IFR	2974 (546)	1486 (273)		2974 (0)	1487 (273)	1487 (273)			1487 (273)	1487 (273)	1487 (273)	

Note: Closed pattern operations per year, number in parenthesis indicates night operations

ALZ - Assault Landing Zone
DZ - Drop Zone
DZ Ops - Drop Zone Operations
IFR - Instrument Flight Rule
VFR - Visual Flight Rule

Table 2-3 Annual Closed Pattern Operations at Transition Airfields, End-State, Proposed Action

Aircraft	Event	Amarillo	Midland	Lubbock	Clinton-Sherman	Will Rogers	Fort Worth	Robert Gray	Lackland	McConnell	Tinker	Altus	Sooner
C-17	Arrival											4786 (2378)	
	Departure											5248 (1916)	
	VFR	1616 (628)	202 (79)	202 (79)								16086 (6323)	
	IFR	393 (153)	50 (20)	49 (19)								4424 (1721)	
	DZ Ops												2700 (900)
C-5	Arrival												
	Departure												
	VFR												
	IFR												
KC-135	Arrival											2478 (546)	
	Departure											3024 (0)	
	VFR	2974 (655)			2974 (0)	496 (110)	496 (110)			496 (110)	496 (110)	1983 (437)	
	IFR	4460 (819			4460 (0)	744 (137)	744 (137)			744 (137)	744 (137)	2974 (546)	

Note: Closed pattern operations per year, number in parenthesis indicates night operations

C-5 Operations reduced to zero in FY 07

ALZ - Assault Landing Zone

DZ - Drop Zone

DZ Ops - Drop Zone Operations

IFR - Instrument Flight Rule

VFR - Visual Flight Rule

Table 2-4 Average Daily Student Load, Proposed Action

Category	FY 03	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11
KC-135	236	217	200	199	199	194	195	195	195
C-17	195	198	241	247	255	255	260	264	264
C-5 (Excluding BFE Course)	106	108	119	108	102	0	0	0	0
C-5 (BFE Course Only)	24	24	24	24	24	24	24	24	24
Total	**561**	**547**	**584**	**578**	**580**	**473**	**479**	**483**	**483**

Note: BFE - Basic Flight Engineer

Table 2-5 Manpower Changes, Proposed Action

Category	Total
Most Efficient Organization	162
58 AS Instructors	64
Base Operating Support	11
Boeing Aircrew Training Systems	188
Total	**425**

Note: 58 AS - 58th Airlift Squadron

2.4.5 Facilities Requirements

To support the beddown of additional C-17 aircraft, the renovation and construction of facilities would be needed to support the training mission at Altus AFB. The departure of the C-5 aircraft would allow for the conversion of existing facilities for C-17 use. Locations of the proposed facilities are depicted on Figure 2-1. Summaries of the proposed facility actions are presented in Table 2-6.

2.5 DESCRIPTION OF THE NO-ACTION ALTERNATIVE

Under the no-action alternative, Altus AFB would not implement any of the actions proposed in Section 2.4. C-17 training at Altus AFB would continue at, or near, the maximum capacity allowed by 10 aircraft. C-17 aircrew training at Altus AFB would not be able to meet demand created to support the National Military Strategy and MPD training requirements.

2.6 DETAILED DESCRIPTION OF OTHER ACTION ALTERNATIVES

Alternatives were considered when formulating the proposed action. Specifically, the consideration of alternatives focused on airspace utilization and the construction of an ALZ. Assigned aircraft and operations (Section 2.4.1) and student loads (Section 2.4.4) would be the same as discussed for the proposed action. Airspace and training locations, transition training, and facilities requirements are discussed in the following sections.

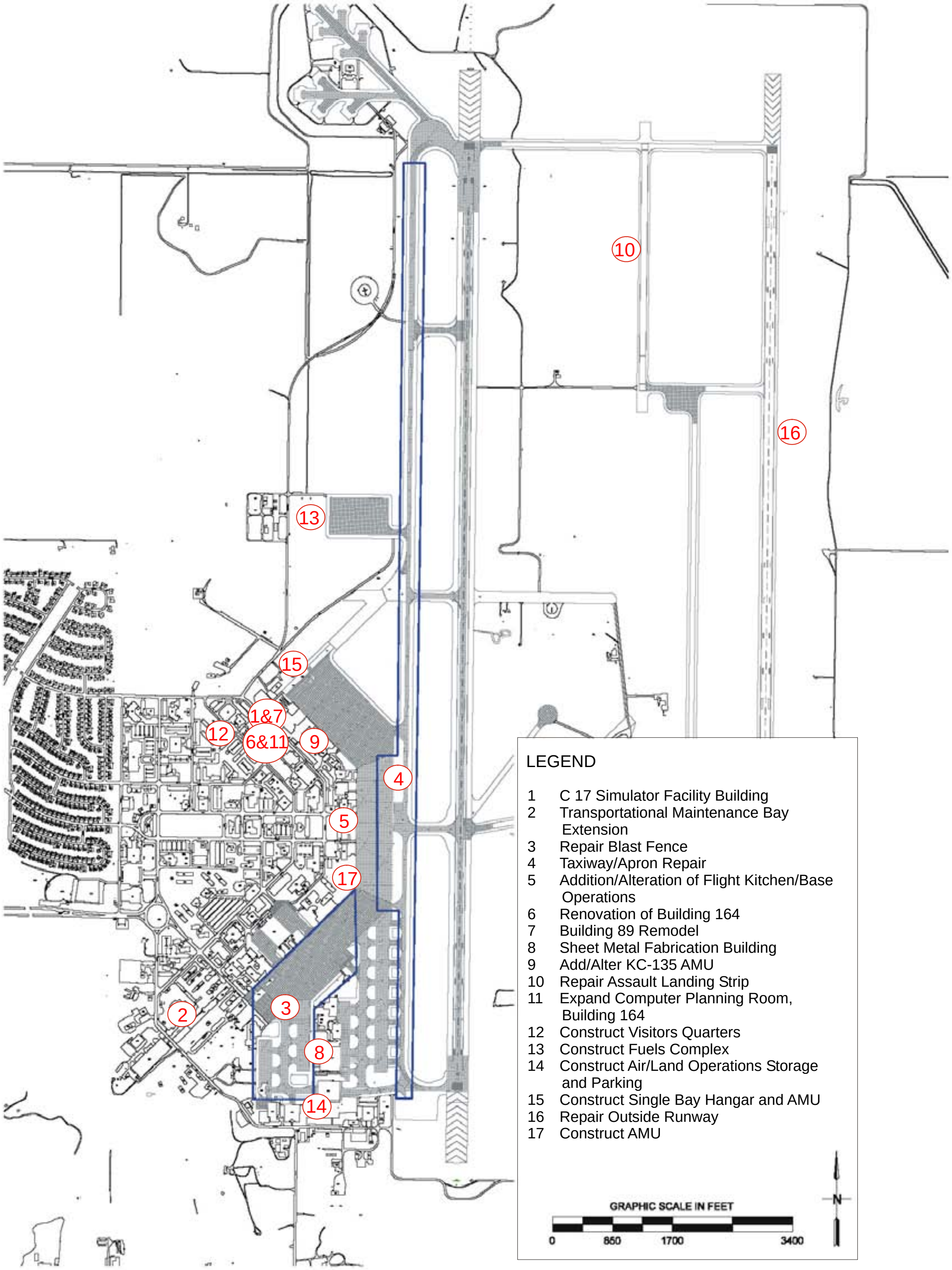


Figure 2-1 Facilities Requirements, Proposed Action

Table 2-6 Facilities Requirements, Proposed Action

Project Name	FY	Requirement	Description
C-17 Simulator Facility Building	2003	2,500 sf	Remodel Existing C-141 Bay
Transportation Maintenance Bay Extension	2004	500 sf	Increase from 12 to 14 loaders
Repair Blast Fence	2005	750 LF	Replace 14-foot fence with 20-foot fence
Taxiway/Apron Repair	2005		
Expand Flight Kitchen	2004	1,600 sf	Addition to southwest corner of Building 185
Renovation of Building 164	2007	7,700 sf	Renovation to support C-17 squadron
Building 89 Remodel	2006	5,000 sf	Remodel existing C-141 and KC-135 bays
Sheet Metal Fabrication Building	2007	5,100 sf	Addition/Alteration of Hangar 157
Add/Alter KC-135 AMU	2007	7,120 sf	Supports C-17 refueling operations
Repair Assault Landing Strip	2003	35,150 sy	Seal existing pavement
Expand Computer Planning Room, Building 164	2005	1,245 sf	Expand into existing briefing rooms
Construct Visitors Quarters	2007	65,000 sf	100 person
Construct Fuels Complex	2007	7,250 sf	Consolidates 4 separate buildings
Construct Air/Land Operations Storage and Parking	2007	5,000 sf 15,000 sy	Storage Parking
Construct Single Bay Hangar and AMU	2010	110,000 sf 75,000 sf	Consolidated AMU for KC-135s and C-17s
Repair Outside Runway	2005	170,000 sy	Perform runway repairs and improvements
Construct AMU	2007	75,000 sf	Consolidated AMU for KC-135s and C-17s

sf = square feet, sy = square yards, LF = linear feet, AMU = Aircraft Maintenance Unit (facility to support maintenance technicians preparing aircraft for missions).

2.6.1 Assault Landing Zone Sites

Four candidate sites have been identified for the construction of an ALZ. Two proposed sites are located near the Sooner DZ and two are located at the CSIA. One would be selected and utilized. The locations are described in the following sections.

2.6.1.1 Sooner Assault Landing Zone Site 1

Approximately 800 acres of land located to the west of the existing Sooner DZ would be acquired and improved with a 5,000-foot runway, parallel taxiway, and turn-around areas located at both ends. The runway would be aligned with the existing low level routes into the Sooner DZ but offset so that both DZ and ALZ activities could occur simultaneously. Construction of the ALZ at this location would require the construction of roads, utilities, a fire station, and facilities for security personnel (Section 2.6.5). The location of Sooner ALZ Site 1 is presented in Figure 2-2. In addition, the figure depicts the location and extent of proposed avigation easements required under the alternative action.

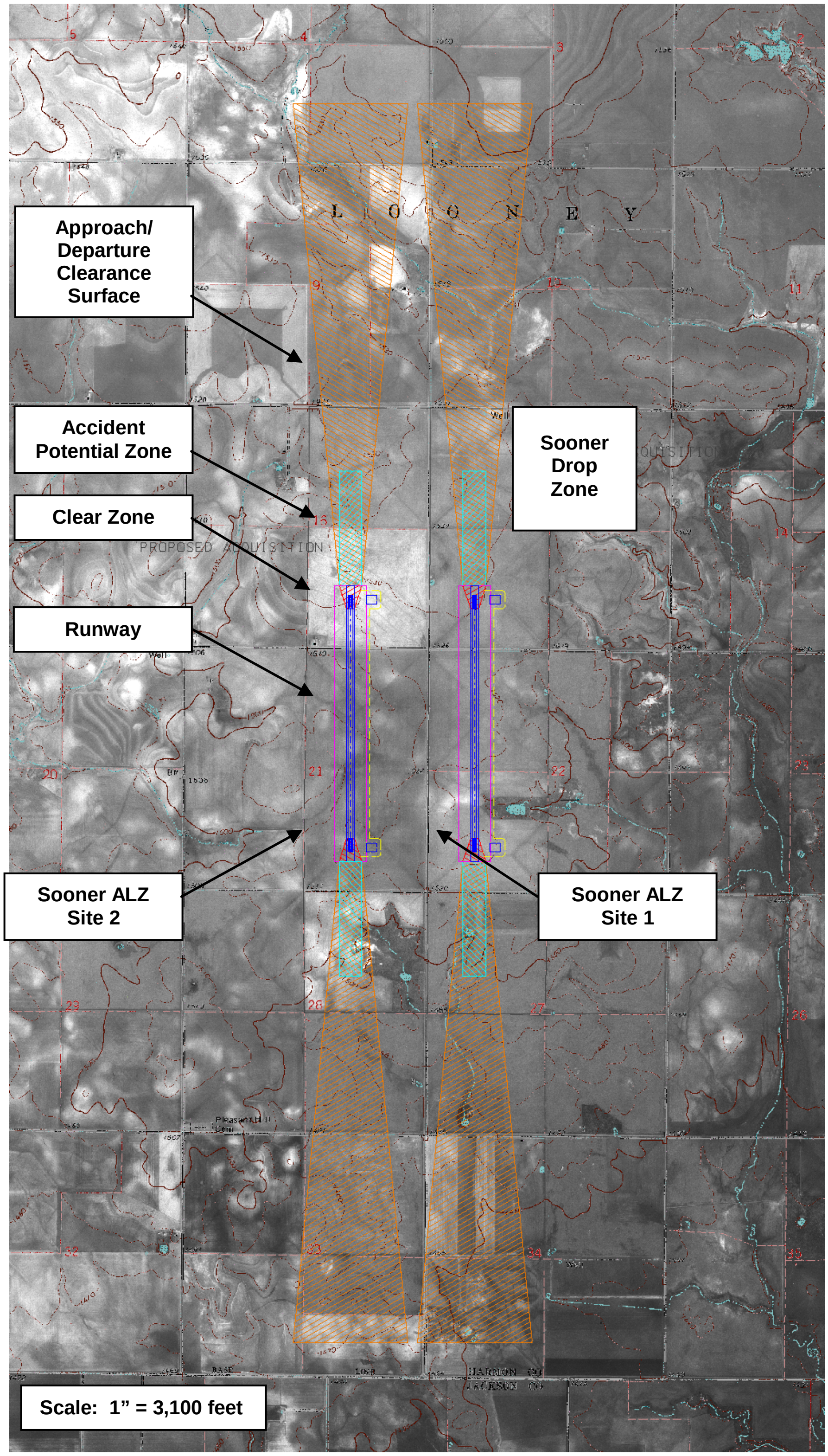


Figure 2-2 Site Location, Sooner Assault Landing Zone Sites 1 and 2

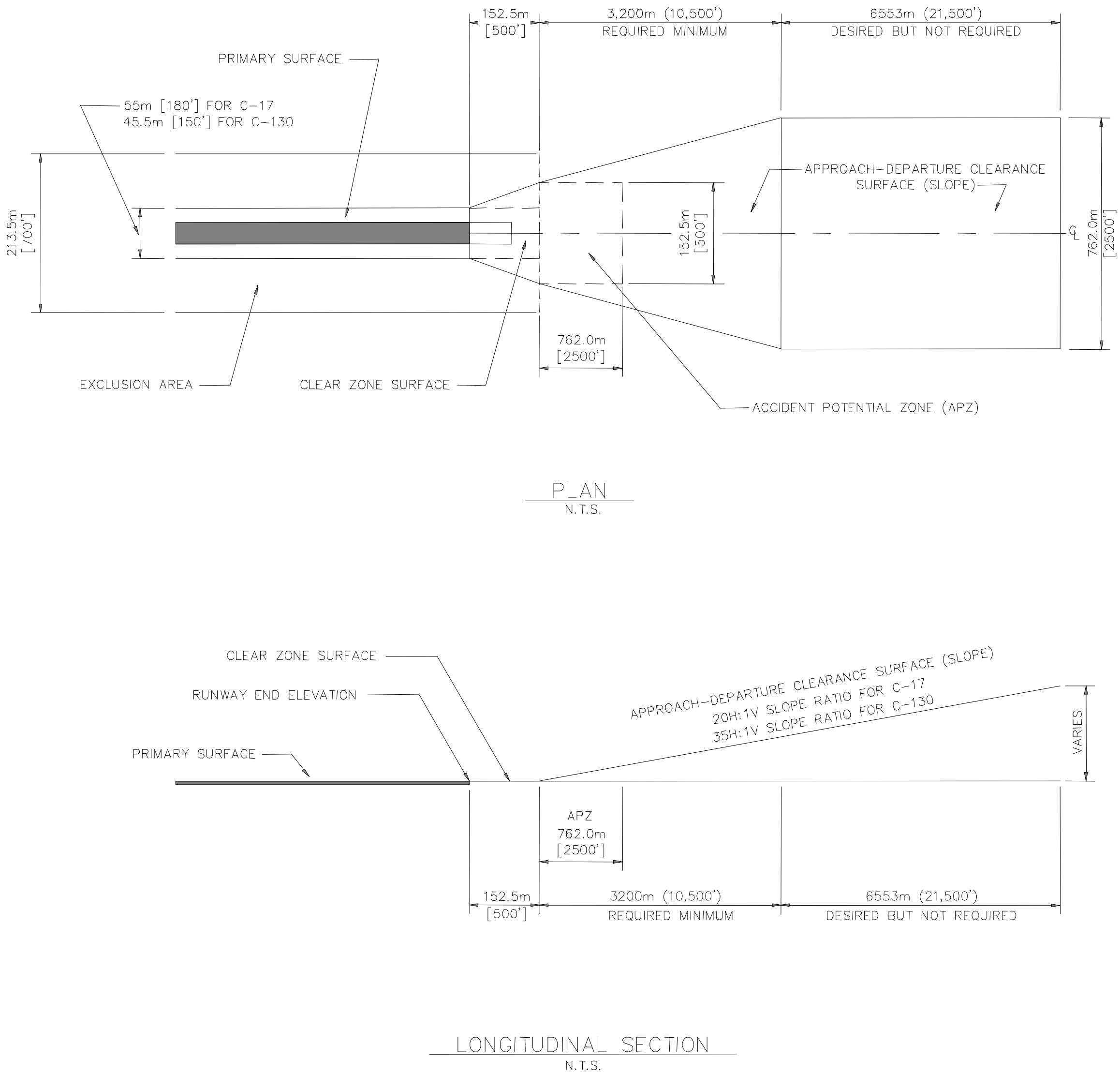
The 800 acres would include a clear zone area, with the inner width of 180 feet and the outer width of 500 feet and the horizontal length of 500 feet, located on both ends of the runway. Also, the Air Force would acquire approximately 583 acres of avigation easements at both ends of the runway to allow for the frequent and recurring aircraft departures over private lands up to the elevation of 500 feet AGL where public domain airspace begins. The easement would prohibit incompatible structures and land uses under the approach and departure areas. Easements would be required within a trapeziod shaped area, identified as the approach-departure clearance surface, extending outward from the end of the runway a distance of approximately 2 miles. The narrowest end at the runway would be 500-feet wide and would extend to approximately 2,500-feet wide. Figure 2-3 depicts a typical Air Force clear zone and the approach-departure clearance surface. In addition, mineral rights would be required over the entire 1,383 acres of land and easements. Temporary construction easements may also be required as well to facilitate the ALZ improvements.

2.6.1.2 Sooner Assault Landing Zone Site 2

The land and easement acquisition and improvements would be the same as identified for Sooner DZ 1 (Section 2.6.1.1); however, the property would be located ½ mile west of Sooner ALZ Site 1. The location of Sooner ALZ Site 2 is depicted on Figure 2-2.

2.6.1.3 Clinton-Sherman Site 1

Lease or purchase inside CSIA for airfield facilities and clear zones would acquire approximately 145 acres of land. Construction projects would include a 4,500 foot assault runway with turnaround areas at both ends; taxiways for connecting the north and south ends of the assault runway to the existing CSIA main runway for take offs; and an approximately 2,250-foot long by 20-foot wide asphalt road from the assault runway to the fire station located on the east side of the CSIA main runway. The assault runway would be west of and parallel to the existing CSIA main runway. The demolition/removal of the following improvements in the footprint/exclusion areas of Clinton-Sherman Site 1 would be required: a gun range, a concrete block security building, a vacant concrete block warehouse/storage building, poles associated with a vacant concrete block communications building, an electric transformer substation and concrete block emergency-generator building, a well house, an above ground water storage tank, a concrete block storage building, a concrete block warehouse building located just outside the west boundary of the acquisition area. The following utilities/facilities would require relocation: AEP Public Service Company Electric Service underground electric line and above ground transformers, ALLTELL telephone line, Oklahoma Natural Gas Service gas line, water well and water storage tank, and an asphalt road. Also, the Air Force would acquire approximately 693 acres of avigation easements at both ends of the runway over private property outside of CSIA. Several home sites and other related improvements and structures in the area required for the approach-departure clearance surface would be demolished and removed. Temporary construction easements may be required as well to facilitate the ALZ improvements. In addition, permanent easements may be necessary to restrict activities that would interfere with aviation. The location of Clinton-Sherman ALZ Site 1 is presented in Figure 2-4. Avigation easements required under this alternative would be similar to those depicted on Figure 2-2. Changes to airport layout are subject to approval by the FAA.



Source: AFCESA 1998

Figure 2-3 Typical Clear Zone and Approach-Departure Clearance Surface

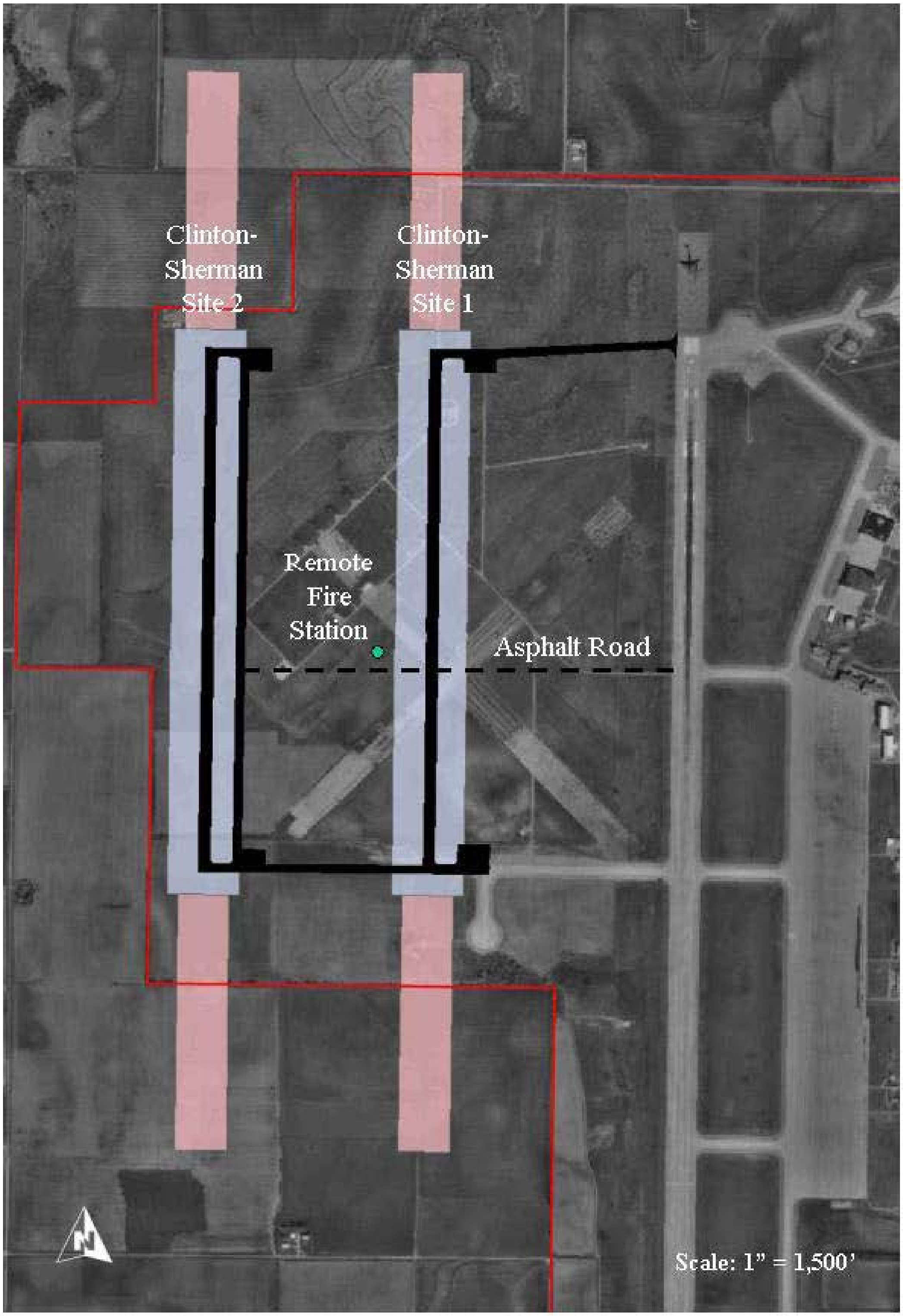


Figure 2-4 Site Location, Clinton-Sherman Assault Landing Zone Sites 1 and 2

2.6.1.4 Clinton-Sherman Site 2

Lease or purchase inside CSIA for airfield facilities and clear zones would acquire approximately 132 acres of land. Construction projects would include a 4,500 foot assault runway with turnaround areas at both ends; taxiways for connecting the north and south ends of the assault runway to the existing CSIA main runway for take offs; and an approximately 4,500-foot long by 20-foot wide asphalt road from the assault runway to the fire station located on the east side of the CSIA main runway. The assault runway would be west of and parallel to the existing CSIA main runway and approximately ½ mile west of Clinton-Sherman ALZ Site 1. A parallel taxiway would be added to the assault runway and the taxiway would be slightly longer to tie in the assault runway with the existing CSIA main runway for takeoffs. This location would require the construction of a remote fire station and facilities for security personnel. An Enogex gas line and natural gas wellhead and an asphalt road would require relocation. Also, the Air Force would acquire approximately 713 acres of avigation easements at both ends of the runway over private property outside of CSIA. Several home sites and other related improvements and structures in the area required for the approach-departure clearance surface would be demolished and removed. Temporary construction easements may be required as well to facilitate the ALZ improvements. In addition, permanent easements may be necessary to restrict activities that would interfere with aviation. The location of Clinton-Sherman ALZ Site 2 is presented in Figure 2-4. Avigation easements required under this alternative would be similar to those depicted on Figure 2-2. Changes to airport layout are subject to approval by the FAA.

2.6.2 Airspace

Under the alternative action, there would be changes to the frequency of use of SRs, VRs, and IRs currently in use. The changes would be necessitated based on the selection of the alternate ALZs and additional airspace usage would occur near either of the candidate sites. If either of the candidate sites at the CSIA are selected, modification of one visual route (VR-144) would be necessary to allow for high speed (250-340 knots), low altitude (300 feet) tactical arrivals to CSIA for tactical training. The current and anticipated frequency of use (by month) for all routes are presented in Table 2-7. Night operations are presented in parentheses.

2.6.3 Transition Training

Under the alternative action, C-17 aircraft would use the same transition fields that are currently used by Altus AFB. However, transition fields would be used at a higher rate than current C-17 use. The selected ALZ would absorb a large portion of the increased training. Regardless of the ALZ selected, depending on a variety of factors including availability of the Altus AFB ALZ and weather, the selected new ALZ could be used for up to 100% of 15 C-17 aircraft conducting assault training. In addition, the construction of an ALZ would eliminate the need to conduct additional transition training at existing or new locations for the KC-135 aircraft. There would be no changes to the current transition training conducted at the Amarillo IAP, Midland IAP, Lubbock IAP, and the CSIA. The CSIA would see a significant increase in C-17 operations if selected as the site for an ALZ and airport operating hours would be revised to close at 2:00 a.m. (currently tower operations run from 8:00 a.m. to 10:00 p.m.).

Table 2-7 C-17 Monthly Use of Military Training Routes, Alternate Action

Description	Current C-17	FY 07	FY 11
SR-205	1 (0)	20 (5)	30 (7)
SR-206	1 (0)	20 (5)	30 (7)
SR-208	1 (0)	20 (5)	30 (7)
SR-216	3 (1)	20 (5)	30 (7)
SR-217	55 (20)	72 (26)	83 (30)
VR-144	3 (2)	20 (5)	30 (7)
VR-144 (extended)	N/A	20 (12)	25 (15)
VR-184	33 (20)	43 (26)	50 (30)
VR-190	55 (20)	72 (26)	83 (30)
VR-191	6 (2)	20 (5)	30 (7)
VR-198	1 (0)	20 (5)	30 (7)
VR-199	1 (0)	20 (5)	30 (7)
IR-103	22 (0)	28 (0)	33 (7)
IR-154	2 (0)	20 (5)	30 (7)
IR-155	4 (0)	20 (5)	30 (7)

Note: Uses per month, number in parenthesis indicates night operations

Robert Gray AAF and Fort Worth NAS would not be included under the alternative action. There would be no changes to the types of training events at the transition locations.

Airfield utilization under the alternative action associated with peak-state conditions is presented in Table 2-8 (with night operations presented in parentheses) and Table 2-9 presents airfield utilization under end-state conditions (night operations in parentheses) for the Sooner ALZ sites. Airfield utilization under the alternative action for CSIA associated with peak-state conditions is presented in Table 2-10 (with night operations presented in parentheses) and Table 2-11 presents airfield utilization under end-state conditions (night operations in parentheses) for the Sooner ALZ sites.

2.6.4 Manpower

The manpower requirements associated with the addition of up to eight C-17 aircraft would be the same as identified for the proposed action. However, ten additional personnel for fire and security forces for the operation of the ALZ would be needed at the location.

2.6.5 Facilities Requirements

The facilities requirements identified for the proposed action would also be required for the alternative action. However, two additional projects, as identified in Table 2-12, would be needed. A layout of the ALZ and support facilities is depicted in Figure 2-5.

Table 2-8 Annual Closed Pattern Operations at Transition Airfields, Peak-State, Sooner Assault Landing Zone Sites, Alternative Action

Aircraft	Event	Amarillo	Midland	Lubbock	Clinton-Sherman	Will Rogers	Fort Worth	Robert Gray	Lackland	McConnell	Tinker	Altus	Sooner
C-17	Arrival											4786 (2378)	
	Departure											5248 (1916)	
	VFR	1616 (628)	202 (79)	202 (79)								16086 (6323)	
	IFR	393 (153)	50 (20)	49 (19)								4424 (1721)	
	DZ Ops												2700 (900)
	ALZ Arrivals												2255 (877)
	ALZ Departures												2255 (877)
	ALZ Patterns												9092 (3536)
	NVG Arrivals				300 (0)								300 (300)
	NVG Departures				150 (150)								300 (300)
	NVG Patterns				2100 (750)								300 (300)
C-5	Arrival											1234 (198)	
	Departure											1432 (0)	
	VFR	1411 (22)	705 (11)		2116 (0)			1411 (22)	705 (10)			705 (10)	
	IFR	852 (8)	426 (4)		1278 (0)			852 (8)	426 (4)			426 (4)	
KC-135	Arrival											2478 (546)	
	Departure											3024 (0)	
	VFR	1982 (437)	992 (219)		1982 (0)	992 (219)	992 (219)			992 (219)	992 (219)	992 (219)	
	IFR	2974 (546)	1486 (273)		2974 (0)	1487 (273)	1487 (273)			1487 (273)	1487 (273)	1487 (273)	

Note: Closed pattern operations per year, number in parenthesis indicates night operations

C-5 Operations reduced to zero in FY 07
ALZ - Assault Landing Zone
DZ - Drop Zone
DZ Ops - Drop Zone Operations
IFR - Instrument Flight Rule
NVG - Night Vision Goggle
VFR - Visual Flight Rule

Table 2-9 Annual Closed Pattern Operations at Transition Airfields, End-State, Sooner Assault Landing Zone Sites, Alternative Action

Aircraft	Event	Amarillo	Midland	Lubbock	Clinton-Sherman	Will Rogers	Fort Worth	Robert Gray	Lackland	McConnell	Tinker	Altus	Sooner
C-17	Arrival											4786 (2378)	
	Departure											5248 (1916)	
	VFR	1616 (628)	202 (79)	202 (79)								16086 (6323)	
	IFR	393 (153)	50 (20)	49 (19)								4424 (1721)	
	DZ Ops												2700 (900)
	ALZ Arrivals												2255 (877)
	ALZ Departures												2255 (877)
	ALZ Patterns												9092 (3536)
	NVG Arrivals				300 (0)								300 (300)
	NVG Departures				150 (150)								300 (300)
	NVG Patterns				2100 (750)								300 (300)
C-5	Arrival												
	Departure												
	VFR												
	IFR												
KC-135	Arrival											2478 (546)	
	Departure											3024 (0)	
	VFR	2974 (655)			2974 (0)	496 (110)	496 (110)			496 (110)	496 (110)	1983 (437)	
	IFR	4460 (819			4460 (0)	744 (137)	744 (137)			744 (137))	744 (137)	2974 (546)	

Note: Closed pattern operations per year, number in parenthesis indicates night operations

C-5 Operations reduced to zero in FY 07
ALZ - Assault Landing Zone
DZ - Drop Zone
DZ Ops - Drop Zone Operations
IFR - Instrument Flight Rule
NVG - Night Vision Goggle
VFR - Visual Flight Rule

Table 2-10 Annual Closed Pattern Operations at Transition Airfields, Peak-State, Clinton-Sherman Assault Landing Zone Sites, Alternative Action

Aircraft	Event	Amarillo	Midland	Lubbock	Clinton-Sherman	Will Rogers	Fort Worth	Robert Gray	Lackland	McConnell	Tinker	Altus	Sooner
C-17	Arrival											2531 (1501)	
	Departure											2993 (1039	
	VFR	1616 (628)	202 (79)	202 (79)								6992 (2786)	
	IFR	393 (153)	50 (20)	49 (19)								4424 (1721)	
	DZ Ops. [1]												2700 (900)
	ALZ Arrivals				2255 (877)								
	ALZ Departures				2255 (877)								
	ALZ Patterns				9092 (3536)								
	NVG Arrivals				300 (0)								
	NVG Departures				150 (150)								
	NVG Patterns				2700 (1050)								
C-5	Arrival											370 (59)	
	Departure											430 (0)	
	VFR	1411 (22)			2116 (0)			705 (11)	705 (10)			2116 (33)	
	IFR	852 (8)			1278 (0)			426 (4)	426 (4)			1278 (11)	
KC-135	Arrival											2478 (546)	
	Departure											3024 (0)	
	VFR	992 (219)			1982 (0)					496 (110)	496 (110)	5948 (1310)	
	IFR	1487 (273)			2974 (0)					744 (137)	744 (137)	8921 (1638)	

Note: Closed pattern operations per year, number in parenthesis indicates night operations

C-5 Operations reduced to zero in FY 07
ALZ - Assault Landing Zone
DZ - Drop Zone
DZ Ops - Drop Zone Operations
IFR - Instrument Flight Rule
NVG - Night Vision Goggle
VFR - Visual Flight Rule

Table 2-11 Annual Closed Pattern Operations at Transition Airfields, End-State, Clinton-Sherman Assault Landing Zone Sites, Alternative Action

Aircraft	Event	Amarillo	Midland	Lubbock	Clinton-Sherman	Will Rogers	Fort Worth	Robert Gray	Lackland	McConnell	Tinker	Altus	Sooner
C-17	Arrival											2531 (1501)	
	Departure											2993 (1039)	
	VFR		202 (79)	202 (79)								6992 (2786)	
	IFR		50 (20)	49 (19)								4424 (1721)	
	DZ Ops												2700 (900)
	ALZ Arrivals				2255 (877)								
	ALZ Departures				2255 (877)								
	ALZ Patterns				9092 (3536)								
	NVG Arrivals				300 (0)								
	NVG Departures				150 (150)								
	NVG Patterns				2700 (1050)								
C-5	Arrival												
	Departure												
	VFR												
	IFR												
KC-135	Arrival											2478 (546)	
	Departure											3024 (0)	
	VFR	1982 (437)			2974 (0)							6938 (1504)	
	IFR	2974 (546)			4460 (0)							10408 (1911)	

Note: Closed pattern operations per year, number in parenthesis indicates night operations

C-5 Operations reduced to zero in FY 07
ALZ - Assault Landing Zone
DZ - Drop Zone
DZ Ops - Drop Zone Operations
IFR - Instrument Flight Rule
NVG - Night Vision Goggle
VFR - Visual Flight Rule

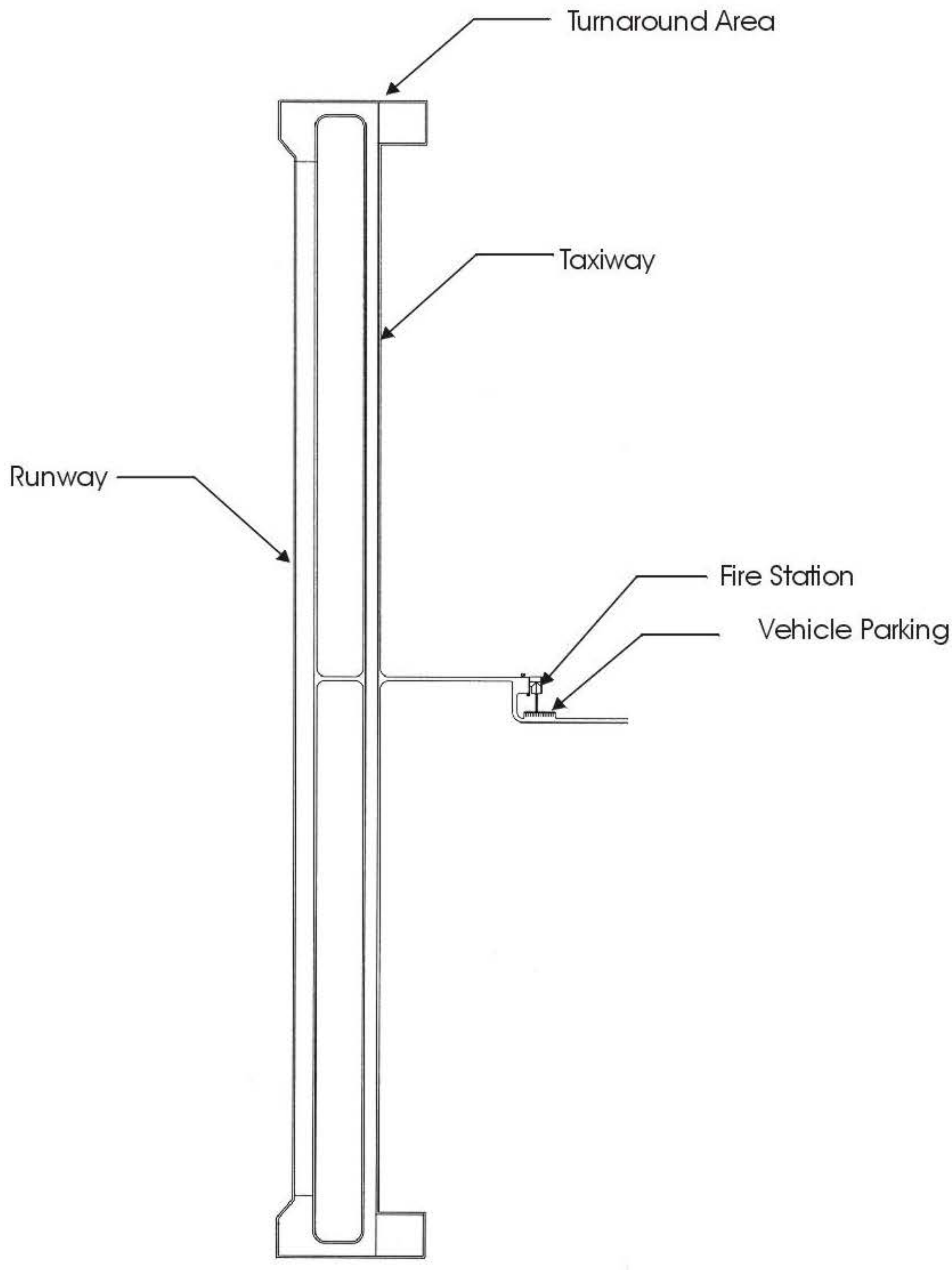


Figure 2-5 Assault Landing Zone and Support Facilities Concept

Table 2-12 Facility Requirements, Alternative Action

Project Name	FY	Requirement	Description
ALZ Land Acquisition	2005	800 Acres	
Construct Assault Landing Zone	2005	1 Each	Includes auxiliary fire station

2.7 PAST, PRESENT, AND REASONABLY FORESEEABLE ACTIONS IN THE REGION OF INFLUENCE

Cumulative impacts to environmental resources result from the incremental effects of proposed actions when combined with other past, present, and reasonably foreseeable future projects in the region of influence (ROI). Cumulative impacts can result from individually minor, but collectively substantial, actions undertaken over a period of time by various agencies (federal, state, or local) or individuals. In accordance with NEPA, a discussion of cumulative impacts resulting from projects that are proposed, under construction, recently completed, or anticipated to be implemented in the near future is required. Specific projects are described in the sections below.

2.7.1 Construct Base Civil Engineer Complex

In addition to the current project, Altus AFB has announced the plans for the construction of a Base Civil Engineer Complex (AGGN 97-3014). The Civil Engineer (CE) functions now occupy 19 facilities at the installation. Several of the facilities are early 1950s wooden frame construction and have deteriorated beyond economical repair. Problems included poor lighting, no insulation, inefficient mechanical systems, and lack of fire protection systems. The lack of adequate space and use of substandard facilities, coupled with the separation of related functions, prohibits effective utilization of staff hours, delays to management decisions, work force inefficiency, and degrades prompt completion of engineering operations action. Accordingly, Altus AFB has proposed the construction of a complex to develop, program, and execute requirements to maintain, repair, operate, and construct base facilities, pavements, and utility systems in support of the base mission and individual and organizational customers. The activities include the demolition of 10 buildings (Buildings 30, 347, 355, 356, 357, 359, 362, 365, 373, and 447) totaling 81,100 square feet and the construction of 5 buildings (Administrative Facility, Pavement & Grounds Shop, Maintenance Shops, Covered High Storage Bay, and Covered Low Storage Bay) totaling 102,810 square feet. Construction consists of concrete foundations and floor slabs, steel frames, concrete aggregate pre-cast walls, standing seam metal roof, and utilities. The location of the Base CE Complex is depicted on Figure 2-6.

2.7.2 Military Family Housing Privatization

Altus AFB has plans to privatize military family housing (MFH) at the installation by entering into a real estate transaction with a private developer to plan, design, develop, demolish, construct, renovate, replace, own, operate, maintain and manage the MFH for military personnel for a period of 50 years. Based on the condition, size, and functionality assessments of the existing 965 units, 142 units require demolition and replacement, 401 units require whole-house

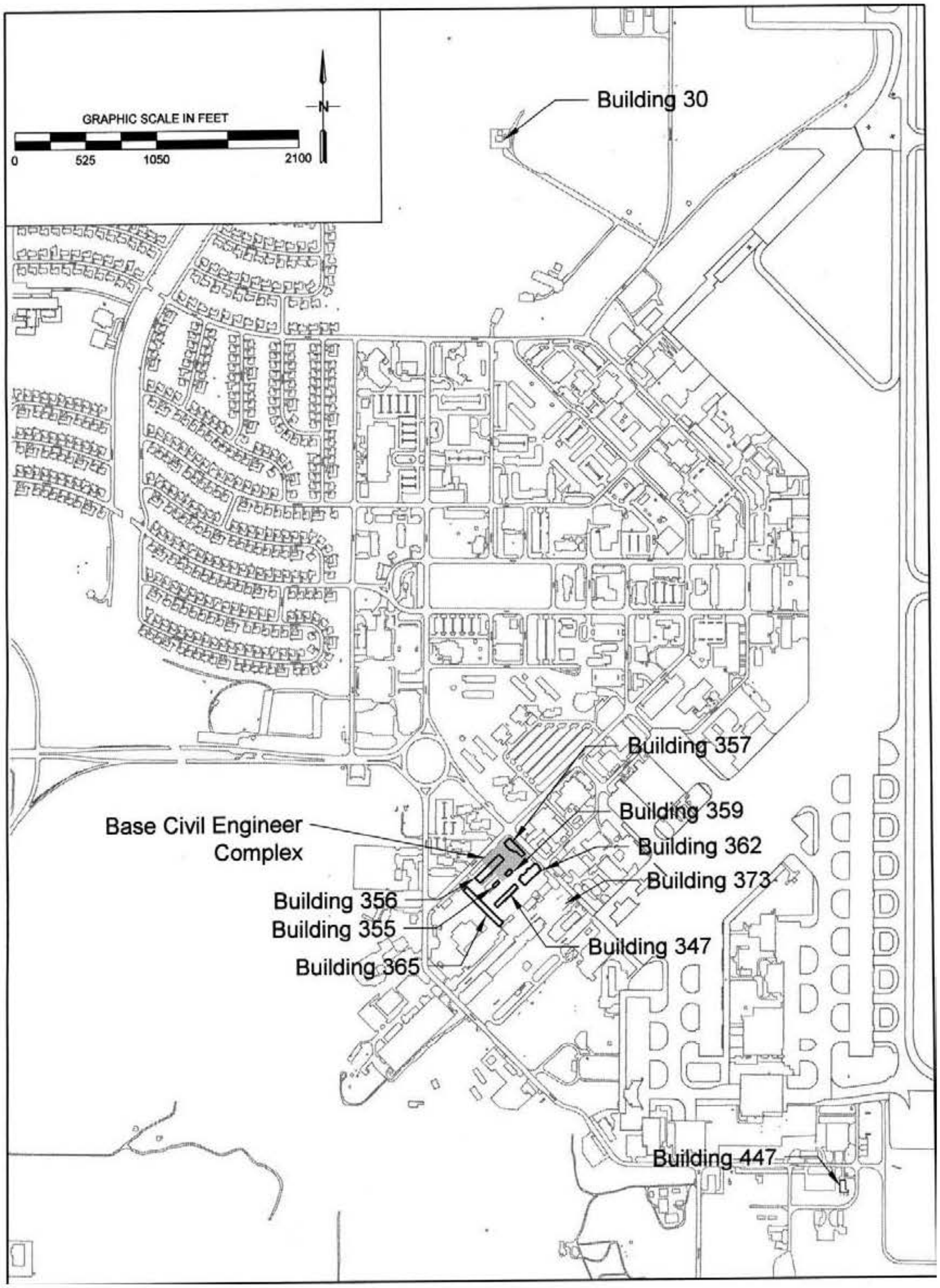


Figure 2-6 Base Civil Engineer Complex, Altus Air Force Base, Oklahoma

renovation, 183 units require new storm shelters, and 239 excess units require demolition. Housing proposed for privatization includes the Bicentennial (86 units), Great Plains (184 units) and Capehart (700 units) housing areas. All of the utility lines (water, sewer, and gas mains and laterals) in the housing areas would also be conveyed to the privatization contractor. Overall, privatization would include conveyance of all MFH units to a private developer for a period of 50 years beginning in FY 05. The Government would retain ownership of the underlying land and lease it to the private developer.

2.7.3 Defense Access Road, Sooner Drop Zone Vicinity

The Oklahoma Department of Transportation and the Air Force propose the construction of a Defense Access Road in the vicinity of the Sooner DZ. A six-mile long, two-lane gravel road would be constructed from Oklahoma Highway 62 to the northwest corner of the existing Sooner DZ, then a two-mile long, two-lane asphalt road to the southeast corner of the existing drop zone. In addition, the road will be widened from 15 to 20 feet.

2.7.4 Oklahoma Spaceport

Also, the Oklahoma Space Industry Development Authority (OSIDA), a state agency, proposes to develop and operate a commercial launch site at the CSIA. To operate a commercial launch facility, OSIDA must obtain a launch site operator license from the FAA. The FAA is preparing an environmental impact statement for OSIDA's proposed operations at the CSIA prior to deciding whether to issue a commercial launch site operator license. The FAA regulates launch operations consistent with its safety responsibilities and US national security and foreign policy interests. OSIDA plans to operate a facility to launch manned vehicles, satellites, and other payloads into sub-orbital trajectories and low earth orbits. A layout of the current and proposed facilities is on Figure 2-7.

2.7.5 Digital Airport Surveillance Radar Facility

The FAA has proposed the installation and operation of a Digital Airport Surveillance Radar (DASR) system at Altus AFB. DASR is a new terminal air traffic control radar system that replaces current analog systems with new digital technology. The Air Force Electronics Systems Center and the FAA are in the process of procuring DASR systems to upgrade existing radar facilities for DoD and civilian airfields. The DASR system detects aircraft position and weather conditions in the vicinity of civilian and military airfields. The Government nomenclature for this radar is the ASR-11.

The ASR-11 system consists of two electronic subsystems: a primary surveillance radar and a secondary surveillance radar, sometimes called the beacon. The primary surveillance radar uses a continually rotating antenna mounted on a tower to transmit electromagnetic waves which reflect or backscatter from the surface of aircraft up to 60 miles from the radar. The radar system measures the time required for a radar echo to return and the direction of the signal. From this data the system can then measure the distance of the aircraft from the radar antenna and the

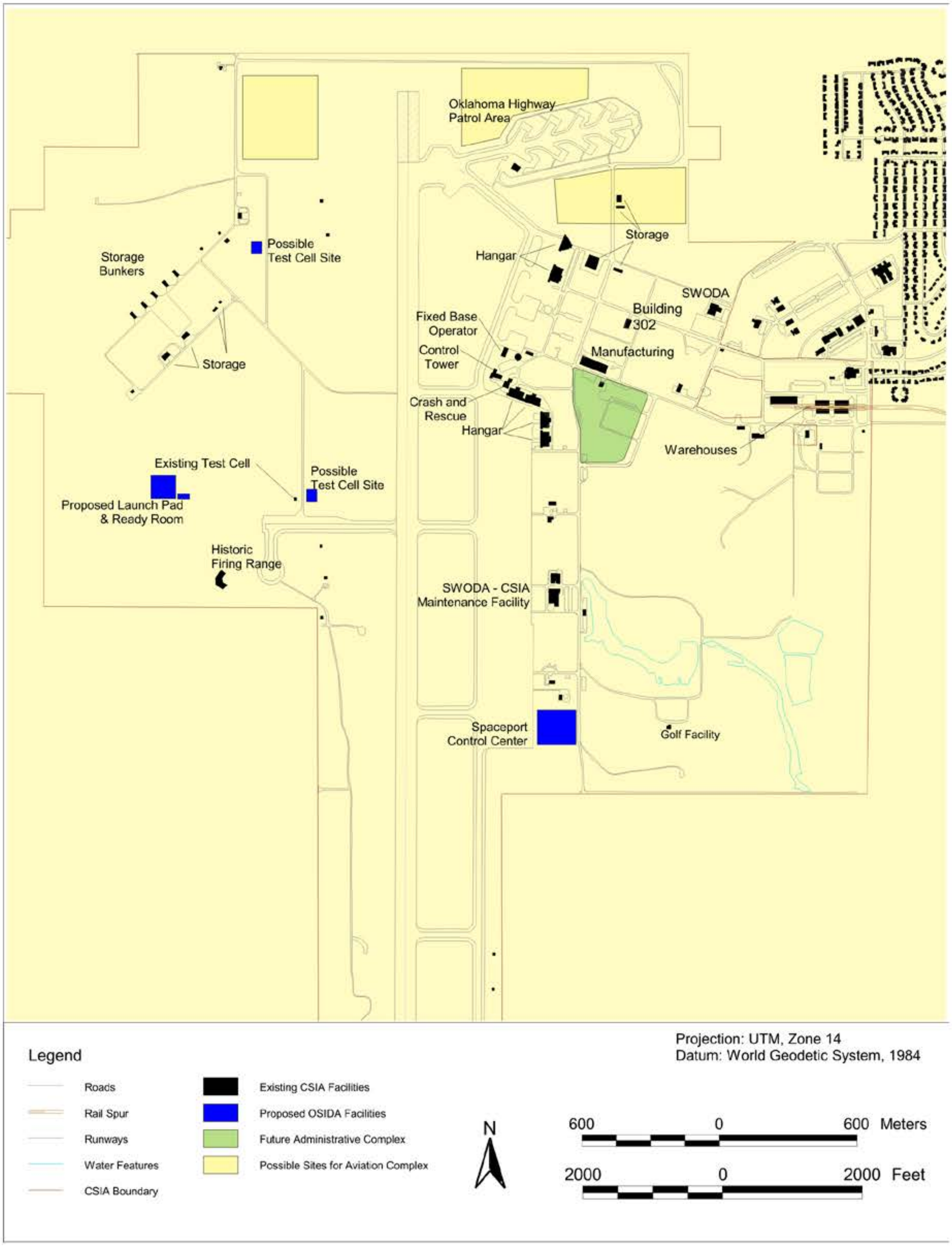


Figure 2-7 Current and Proposed Facilities, Clinton-Sherman Industrial Airpark

azimuth or direction of the aircraft from the antenna. The primary radar also provides data on six levels of rainfall intensity. The primary radar operates in the range of 2,700 to 2,900 megahertz (MHz). The transmitter generates a peak effective power of 25 kiloWatt (kW) and an average power of 2.1 kW. Average power density of the ASR-11 signal decreases with distance from the antenna. At distances of more than 43 feet from the antenna, the power density of the ASR-11 signal would fall below the maximum permissible exposure levels established by the Federal Communications Commission.

The secondary radar, also called the monopulse secondary surveillance radar, uses a second radar antenna attached to the top of the primary radar antenna to transmit and receive area aircraft data for barometric altitude, identification code, and emergency conditions. Military and commercial aircraft have transmitters that automatically respond to a signal from the secondary radar by reporting an identification code and altitude. The air traffic control uses this system to verify the location of aircraft within a 120-mile radius of the radar site. The beacon radar also provides rapid identification of aircraft in distress. The secondary radar operates in the range of 1,030 to 1,090 MHz. Transmitting power ranges from 160 to 1,500 watts.

The total ASR-11 system also includes the following facilities: an antenna tower, an electronic equipment shelter/building with heating, ventilation and air conditioning, a power distribution system, an uninterruptible power supply, a back-up emergency engine/generator set, fire detection, security, and cabling to connect the radar to the local RAPCON center. Telephone and power lines would also be provided to the site. The tower would be from 17 to 87 feet in height, depending upon local surrounding obstructions to the radar signal such as trees, buildings and local terrain. The radar antenna and lightning masts on the top of the tower add an additional 20 feet to the total height of the structure. An optional radome would extend approximately 10 feet above the antenna for a total structure height of 47 to 107 feet. The typical ASR-11 site is 140 by 140 feet plus a maintenance access road.

2.7.6 C-130 Use of Assault Landing Zone

Establishment of an ALZ could result in C-130 aircraft utilizing the landing zone and DZ for training activities. A specific proposal is not available at this time; however, C-130s would be able to use the ALZ as configured. Therefore, no changes to the layout of the ALZ or land easements would be needed.

2.7.7 Sooner Drop Zone Expansion

The Air Force has proposed the acquisition of a 320-acre tract of land and construction of support facilities, as necessary, to allow for the implementation of dual row airdrop system (DRAS) training at the Sooner DZ. Implementation of DRAS training would require the extension of the length of the DZ to provide the required safety margin. Expanding the DZ by 320 acres ensure 99 percent reliability that the airdrop load will land on the DZ under normal circumstances. To provide the required safety margin, Altus AFB has proposed to extend the length of the Sooner DZ by 840 yards (proposed action).

2.8 COMPARISON MATRIX OF ENVIRONMENTAL EFFECTS OF ALL ALTERNATIVES

Tables 2-13 through 2-17 summarize the impacts of the proposed and alternative actions. Chapter 4 of this EA presents detailed analysis for the proposed and alternative actions, including a cumulative impact analysis for all reasonably foreseeable actions. Potential cumulative impacts of other actions in concert with the proposed action and alternative are not expected to exceed known thresholds and no known synergistic impacts were noted. The impacts for the no-action alternative are the same as baseline conditions.

2.9 MITIGATION

Mitigation measures would not be required for the implementation of the proposed action. Although mitigation measures are not required, this EA identifies actions that could be taken to further reduce those minimal environmental impacts. Chapter 4 provides details on these suggested practices.

Table 2-13 Summary of Environmental Effects, Altus Air Force Base

Topic	Proposed Action	Alternative Action	No-action Alternative
Noise	Acreage in the vicinity of Altus AFB exposed to Ldn 65 dBA or higher would decrease by approximately 16,500 acres. Impacts to military training routes (MTRs) would be less than 2 dBA. Due to the large decrease in the acreage of land exposed to elevated noise under the proposed action, cumulative impacts to sensitive receptors for the proposed and ongoing actions are not expected.	Over 17,900 acres of land exposed to elevated noise levels (greater than 65dBA) at Altus AFB would be eliminated under the alternative action. Impacts to military training routes (MTRs) would be the same as for the proposed action. Due to the large decrease in the acreage of land exposed under the alternative action, cumulative impacts to sensitive receptors for the proposed and ongoing actions are not expected.	Same as for baseline conditions as presented in Section 3.1.2.2. Cumulative impacts to sensitive receptors for the no-action alternative action and ongoing actions would not occur.
Air Quality	Emissions of all pollutants would be less than 250 tons per year (tpy within Air Quality Control Region (AQCR) 189 or 210; therefore, the proposed action would not be considered regionally significant. The cumulative emissions of all pollutants would be less than 250 tons per year for all AQCRs; therefore, the proposed action would not be considered regionally significant.	Air pollutant within AQCR 210 exceed the 250 tpy threshold associated with operations on the Military Training Routes. However, modeling of emissions indicate the alternative action would not result in adverse air quality impacts. Pollutants within AQCR 189 would be less than 250 tpy. The cumulative emissions of all pollutants would be less than 250 tons per year for all AQCRs; therefore, the proposed action would not be considered regionally significant.	Same as for baseline conditions as presented in Section 3.3.2. The cumulative emissions of all pollutants would be less than 250 tons per year for all AQCRs; therefore, the no-action alternative would not be considered regionally significant.
Earth Resources	Soil disturbance of over 11 acres would occur on previously disturbed areas on Altus AFB. Cumulative impacts to earth resources from the proposed and ongoing actions are not expected.	Same as for the proposed action. Cumulative impacts to earth resources from the alternative and ongoing actions are not expected.	Same as for baseline conditions as presented in Section 3.1.4. Cumulative impacts to earth resources from the no-action alternative and ongoing actions are not expected.
Water Resources	The construction of the proposed facilities would add 11.17 acres of impervious (impenetrable) cover at Altus AFB. This is expected to have a minimal impact on the total amount of impervious cover (1.6 percent) and on the total volume of storm water runoff. The construction and addition projects at Altus AFB are expected to cumulatively increase surface cover.	Same as for the proposed action. The alternative and ongoing actions are not expected to cumulatively increase impervious surface cover.	Same as for baseline conditions as presented in Section 3.1.5. Cumulative impacts to water resources from the no-action alternative and ongoing actions are not expected.
Hazardous Materials	Hazardous materials consumption and hazardous waste generation would increase under the proposed action. Increased regulation would not occur. Lead-based paint and asbestos, if encountered, would be managed and disposed according to existing plans and procedures. Cumulative impacts to hazardous materials, hazardous waste, asbestos, and lead-based paint are not expected from the proposed or ongoing actions.	Same as for the proposed action. Cumulative impacts to hazardous materials, hazardous waste, asbestos, and lead-based paint are not expected from the alternative or ongoing actions.	Same as for baseline conditions as presented in Section 3.1.6. Cumulative impacts to hazardous materials, hazardous waste, asbestos, and lead-based paint are not expected from the no-action alternative or ongoing actions.

Table 2-13, Continued

Topic	Proposed Action	Alternative Action	No-action Alternative
Biological Resources	Impacts to vegetative resources would not occur. No impacts to wildlife resources would occur. The proposed action would have no impact on federal and state listed endangered and threatened species as they are not known to occur on or near Altus AFB. The construction activities associated with the proposed action would not occur in wetland areas. All projects associated with the proposed action would not be located within or adjacent to the 100-year floodplain. Impacts to wildlife from aircraft overflights are not expected. The proposed and ongoing actions at Altus AFB would not contribute to cumulative impacts on biological resources.	Same as for the proposed action. The alternative and ongoing actions at Altus AFB would not contribute to cumulative impacts on biological resources.	Same as for baseline conditions as presented in Section 3.1.7. Cumulative impacts to biological resources from the no-action alternative and ongoing actions are not expected.
Cultural Resources	No effect on cultural resources. Consultation regarding Section 106 of the NHPA has been accomplished. Cumulative impact to cultural resources resulting from the implementation of the proposed action and ongoing actions are not expected.	Same as for the proposed action. Cumulative impacts to cultural resources resulting from the implementation of the alternative action and ongoing actions are not expected.	Same as for baseline conditions as presented in Section 3.1.8. Cumulative impacts to cultural resources from the no-action alternative and ongoing actions are not expected.
Infrastructure/ Utilities	The quantity of wastewater generated would increase by 0.043 million gallons per day (mgd), potable water consumption would increase by 0.045 mgd, and about 252 tons of solid waste would be generated from the addition of personnel at Altus AFB. Impervious cover at Altus AFB would increase by 11.1 acres. Additional vehicles would pass through the main gate each day; however, slight impacts to transportation would be expected. Electricity/natural gas consumption would increase over baseline levels. Cumulative impacts to infrastructure and utilities are not expected from implementation of proposed and ongoing actions.	Same as for the proposed action. Cumulative impacts to infrastructure and utilities are not expected from implementation of alternative and ongoing actions.	Same as for baseline conditions as presented in Section 3.1.9. Cumulative impacts to infrastructure and utilities from the no-action alternative and ongoing actions are not expected.

Table 2-13, Continued

Topic	Proposed Action	Alternative Action	No-action Alternative
Socioeconomics	Increase in personnel would off-set population decline since 1990. The proposed construction activities would be in line with previous years construction budgets and not expected to generate large economic benefits for the local community. Slight benefits would result from the increased construction and demolition projects to the local economy. Cumulative impacts to socioeconomics resulting from the implementation of the proposed action and ongoing actions are not expected. Slight benefits would result from the increased construction and demolition projects.	Same as for the proposed action. Cumulative impacts to socioeconomics resulting from the implementation of the alternative and ongoing actions are not expected. Slight benefits would result from the increased construction and demolition projects.	Same as for baseline conditions as presented in Section 3.1.11. Cumulative impacts to socioeconomics resulting from the no-action alternative and ongoing actions are not expected.

Table 2-14 Summary of Environmental Effects, Sooner Drop Zone

Topic	Proposed Action	Alternative Action	No-action Alternative
Noise	No change from baseline conditions as described in Section 3.2.2. Cumulative impacts to sensitive receptors for the proposed and ongoing actions would not occur.	A minimum of 3,473 acres of land exposed to elevated noise levels (greater than 65dBA) at Sooner ALZ 1 or 2 would be added under the alternative action. A maximum of 4 individuals would be exposed to noise levels greater than 65 dBA. Cumulative impacts to sensitive receptors for the alternative and ongoing actions would be the same.	Same as for baseline conditions as presented in Section 3.2.2. Cumulative impacts to sensitive receptors for the no-action alternative action and ongoing actions would not occur.
Air Quality	No change from baseline conditions as described in Section 3.2.3. Cumulative impacts to air quality for the proposed and ongoing actions would not occur.	Emissions of all pollutants would be less than 250 tpy; therefore, the alternative action would not be considered regionally significant. The cumulative emissions of all pollutants would be less than 250 tons per year; therefore, the proposed action would not be considered regionally significant.	Same as for baseline conditions as presented in Section 3.2.3. The cumulative emissions of all pollutants would be less than 250 tons per year; therefore, the proposed action would not be considered regionally significant.
Earth Resources	No change from baseline conditions as described in Section 3.2.4. Cumulative impacts to sensitive receptors for the proposed and ongoing actions would not occur.	A maximum of 23 acres of prime farmland would be set aside from the construction of Sooner ALZ 1 or 2. Soil disturbance would increase soil erosion during construction activities. Cumulative impacts to earth resources from the alternative and ongoing actions are not expected.	Same as for baseline conditions as presented in Section 3.2.4. Cumulative impacts to earth resources from the no-action alternative and ongoing actions are not expected.
Water Resources	No change from baseline conditions as described in Section 3.2.5. Cumulative impacts to water resources from the proposed and ongoing actions would not occur.	The construction of the proposed facilities would add about 26 acres of impervious (impenetrable) cover at Sooner DZ. This is a 2.3% increase, which is expected to have a minimal impact on the total amount of impervious cover and on the total volume of storm water runoff. The alternative and ongoing projects would add about 33 acres of impervious (impenetrable) cover at Sooner DZ. Cumulative impacts to water resources from the alternative and ongoing actions would not occur.	Same as for baseline conditions as presented in Section 3.2.5. Cumulative impacts to water resources from the no-action alternative and ongoing actions are not expected.
Hazardous Materials	No change from baseline conditions as described in Section 3.2.6. Cumulative impacts to hazardous materials, hazardous waste, asbestos, and lead-based paint are not expected from the proposed or ongoing actions.	Neither long-term use of hazardous materials nor generation of hazardous waste (only during construction phase). Lead-based paint and asbestos, if encountered, would be managed and disposed according to Altus AFB's *Lead-Based Paint Management Plan*, *Asbestos Management Plan*, and the *Asbestos Operations Plan*. Cumulative impacts to hazardous materials, hazardous waste, asbestos, and lead-based paint are not expected from the alternative or ongoing actions.	Same as for baseline conditions as presented in Section 3.2.6. Cumulative impacts to hazardous materials, hazardous waste, asbestos, and lead-based paint are not expected from the no-action alternative or ongoing actions.

Table 2-14, Continued

Topic	Proposed Action	Alternative Action	No-action Alternative
Biological Resources	No change from baseline conditions as described in Section 3.2.7. The proposed and ongoing actions at Sooner DZ would not contribute to cumulative impacts on biological resources.	Impacts to vegetative resources would not occur. No impacts to wildlife resources would occur. The proposed action would have no impact on federal and state listed endangered and threatened species as they are not known to occur on or near Sooner DZ. The construction activities associated with the alternative action would not occur in wetland areas. All projects associated with the alternative action would not be located within or adjacent to the 100-year floodplain. Impacts to wildlife from aircraft overflights are not expected. The alternative and ongoing actions at Sooner DZ would not contribute to cumulative impacts on biological resources.	Same as for baseline conditions as presented in Section 3.2.7. Cumulative impacts to biological resources from the no-action alternative and ongoing actions are not expected.
Cultural Resources	No change from baseline conditions as described in Section 3.2.8. Cumulative impact to cultural resources resulting from the implementation of the proposed action and ongoing actions are not expected.	Consultation with the Oklahoma State Historic Preservation Officer (SHPO) has indicated the Air Force would avoid potentially eligible sites, resulting in no effect. The alternative and ongoing actions at Sooner DZ would not contribute to cumulative impacts on cultural resources.	Same as for baseline conditions as presented in Section 3.2.8. Cumulative impacts to cultural resources from the no-action alternative and ongoing actions are not expected.
Socioeconomics	Same as for baseline conditions as presented in Section 3.2.9. Cumulative impacts to socioeconomics resulting from the proposed and ongoing actions are not expected.	Increase in secondary jobs from construction projects. About additional revenue \would be added to the local economy resulting from the construction projects. Additional workers would be added to the Harmon County area for the duration of the construction projects. Cumulative impacts to socioeconomics resulting from the implementation of the alternative action and ongoing actions are not expected. Slight benefits would result from the construction of Sooner ALZ 1 or 2.	Same as for baseline conditions as presented in Section 3.2.9. Cumulative impacts to socioeconomics resulting from the no-action alternative and ongoing actions are not expected.
Transportation	Same as conditions as presented in Section 3.2.10. Cumulative impacts to transportation from the proposed and ongoing actions are not expected.	Same as conditions as presented in Section 3.2.10. Cumulative impacts to transportation from the alternative and ongoing actions are not expected.	Same as for baseline conditions as presented in Section 3.2.10. Cumulative impacts resulting from the no-action alternative and ongoing actions are not expected.

Table 2-15 Summary of Environmental Effects, Clinton-Sherman Industrial Airpark

Topic	Proposed Action	Alternative Action	No-action Alternative
Noise	About 5,200 acres of land exposed to elevated noise levels (greater than 65dBA) at Clinton-Sherman Industrial Airpark (CSIA). A total of 28 additional individuals exposed to elevated noise levels. Cumulative impacts to sensitive receptors for the proposed and ongoing actions would occur.	A maximum of 2,072 acres of land exposed to elevated noise levels (greater than 65dBA) at Clinton-Sherman ALZ 1 or 2 would be added under the alternative action under peak conditions. Under end state conditions, a net reduction of 2,620 acres would occur. A total of 25 additional individuals would be exposed to elevated noise levels (above 65 dBA) under peak conditions. Under end state conditions, no people are exposed to noise levels greater than 75 dBA. Cumulative impacts to sensitive receptors for the alternative and ongoing actions would occur.	Same as for baseline conditions as presented in Section 3.3.2. Cumulative impacts to sensitive receptors for the no-action alternative action and ongoing actions would not occur.
Air Quality	No change from baseline conditions as described in Section 3.3.3. Cumulative impacts to air quality for the proposed and ongoing actions would not occur.	Emissions of all pollutants would be less than 250 tpy; therefore, the alternative action would not be considered regionally significant. The cumulative emissions of all pollutants would be less than 250 tons per year; therefore, the proposed action would not be considered regionally significant.	Same as for baseline conditions as presented in Section 3.3.3. The cumulative emissions of all pollutants would be less than 250 tons per year; therefore, the proposed action would not be considered regionally significant.
Earth Resources	No change from baseline conditions as described in Section 3.3.4. Cumulative impacts to sensitive receptors for the proposed and ongoing actions would not occur.	No prime farmland would be set aside from the construction of Clinton-Sherman ALZ 1 or 2. Soil disturbance would increase soil erosion during construction activities. Cumulative impacts to earth resources from the alternative and ongoing actions are not expected.	Same as for baseline conditions as presented in Section 3.3.4. Cumulative impacts to earth resources from the no-action alternative and ongoing actions are not expected.
Hazardous Materials	No change from baseline conditions as described in Section 3.3.6. Cumulative impacts to hazardous materials, hazardous waste, asbestos, and lead-based paint are not expected from the proposed or ongoing actions.	Neither long-term use of hazardous materials nor generation of hazardous waste (only during construction phase). Lead-based paint and asbestos, if encountered, would be managed and disposed according to Altus AFB's *Lead-Based Paint Management Plan*, *Asbestos Management Plan*, and the *Asbestos Operations Plan*. Cumulative impacts to hazardous materials, hazardous waste, asbestos, and lead-based paint are not expected from the alternative or ongoing actions.	Same as for baseline conditions as presented in Section 3.3.6. Cumulative impacts to hazardous materials, hazardous waste, asbestos, and lead-based paint are not expected from the no-action alternative or ongoing actions.

Table 2-15, Continued

Topic	Proposed Action	Alternative Action	No-action Alternative
Biological Resources	No change from baseline conditions as described in Section 3.3.7. The proposed and ongoing actions at CSIA would not contribute to cumulative impacts on biological resources.	Impacts to vegetative resources would not occur. No impacts to wildlife resources would occur. The proposed action would have no impact on federal and state listed endangered and threatened species as they are not known to occur on or near CSIA. The construction activities associated with the alternative action would not occur in wetland areas. All projects associated with the alternative action would not be located within or adjacent to the 100-year floodplain. Impacts to wildlife from aircraft overflights are not expected. The alternative and ongoing actions at CSIA would not contribute to cumulative impacts on biological resources.	Same as for baseline conditions as presented in Section 3.2.7. Cumulative impacts to biological resources from the no-action alternative and ongoing actions are not expected.
Cultural Resources	No change from baseline conditions as described in Section 3.3.8. Cumulative impact to cultural resources resulting from the implementation of the proposed action and ongoing actions are not expected.	Consultation with the Oklahoma State Historic Preservation Officer (SHPO) has indicated no archeological resources are extant at CSIA. Potential historical resources have been documented and consultation with the SHPO is ongoing. The alternative and ongoing actions at CSIA would not contribute to cumulative impacts on cultural resources.	Same as for baseline conditions as presented in Section 3.3.8. Cumulative impacts to cultural resources from the no-action alternative and ongoing actions are not expected.
Socioeconomics	Same as for baseline conditions as presented in Section 3.3.9. Cumulative impacts to socioeconomics resulting from the proposed and ongoing actions are not expected.	Construction costs would contribute to the local economy; however, economic benefits be dispersed throughout the region. No measurable impact to the local housing market or economy. Cumulative impacts to socioeconomics resulting from the implementation of the alternative action and ongoing actions are not expected. Slight benefits would result from the construction of Clinton-Sherman ALZ 1 or 2.	Same as for baseline conditions as presented in Section 3.3.9. Cumulative impacts to socioeconomics resulting from the no-action alternative and ongoing actions are not expected.

Table 2-16 Summary of Environmental Effects, Amarillo International Airport

Topic	Proposed Action	Alternative Action	No-action Alternative
Noise	About 895 acres of land exposed to elevated noise levels (greater than 65dBA) at Amarillo International Airport (IAP) would be eliminated under the proposed action. Cumulative impacts to sensitive receptors for the proposed and ongoing actions would not occur.	About 900 acres of land exposed to elevated noise levels (greater than 65dBA) at Amarillo IAP would be eliminated under the alternative action. Cumulative impacts to sensitive receptors for the alternative and ongoing actions would occur.	Same as for baseline conditions as presented in Section 3.4.1. Cumulative impacts to sensitive receptors for the no-action alternative action and ongoing actions would not occur.
Air Quality	No change from baseline conditions as described in Section 3.4.2. Cumulative impacts to air quality for the proposed and ongoing actions would not occur.	Emissions of all pollutants would be less than 250 tpy; therefore, the alternative action would not be considered regionally significant. The cumulative emissions of all pollutants would be less than 250 tons per year; therefore, the proposed action would not be considered regionally significant.	Same as for baseline conditions as presented in Section 3.4.2. The cumulative emissions of all pollutants would be less than 250 tons per year; therefore, the proposed action would not be considered regionally significant.

Table 2-17 Summary of Environmental Effects, Lubbock International Airport

Topic	Proposed Action	Alternative Action	No-action Alternative
Noise	About 520 acres of land exposed to elevated noise levels (greater than 65dBA) at Lubbock IAP. A total of 40 additional individuals exposed to elevated noise levels under the proposed action. Cumulative impacts to sensitive receptors for the proposed and ongoing actions would occur.	A maximum of about 400 acres of land exposed to elevated noise levels (greater than 65dBA) at Lubock IAP would be added under the alternative action. A total of 30 additional individuals would be exposed to elevated noise levels. Cumulative impacts to sensitive receptors for the alternative and ongoing actions would occur.	Same as for baseline conditions as presented in Section 3.5.1. Cumulative impacts to sensitive receptors for the no-action alternative action and ongoing actions would not occur.
Air Quality	No change from baseline conditions as described in Section 3.5.2. Cumulative impacts to air quality for the proposed and ongoing actions would not occur.	Emissions of all pollutants would be less than 250 tpy; therefore, the alternative action would not be considered regionally significant. The cumulative emissions of all pollutants would be less than 250 tons per year; therefore, the proposed action would not be considered regionally significant.	Same as for baseline conditions as presented in Section 3.5.2. The cumulative emissions of all pollutants would be less than 250 tons per year; therefore, the proposed action would not be considered regionally significant.

CHAPTER 3

AFFECTED ENVIRONMENT

The affected environment is the baseline against which potential impacts caused by the proposed action and alternatives are assessed. This chapter focuses on the human environment that has the potential to be affected by the proposed C-17 program changes. As stated in 40 CFR §1508.14, the human environment potentially affected is interpreted comprehensively to include the natural and physical resources and the relationship of people with those resources. The approach to defining the environmental baseline was to first identify potential issues and concerns of the proposed action, as discussed in Chapter 4. From this information, the relevant resources are described. All resource areas were evaluated as part of this effort. Those resource areas that were determined to have no potential to be impacted by the proposed action and alternatives, or the impact would be negligible were eliminated from further discussion. The proposed action and alternatives would include the addition of personnel at Altus AFB. Personnel changes at Sooner DZ and CSIA would not occur. Therefore, there would be no measurable change in wastewater and solid waste generation rates, or in energy consumption. For these reasons, sanitary sewer, solid waste, electricity, and natural gas, which are typically assessed under infrastructure and utilities, are not included in this EA for the Sooner DZ or CSIA.

This chapter provides baseline data for the man-made and natural environmental elements that could potentially be affected by the proposed action and alternatives at Altus AFB, Sooner DZ vicinity, CSIA, Amarillo IAP, and Lubbock IAP. MTRs in the vicinity of these locations are included in the relevant areas, as applicable. This chapter is organized by location (i.e., Altus AFB, Sooner DZ vicinity, CSIA, Amarillo IAP, and Lubbock IAP). Information is presented in this section to the level of detail necessary to support the analysis of potential impacts in Chapter 4, Environmental Consequences.

3.1 AFFECTED ENVIRONMENT FOR ALTUS AIR FORCE BASE

3.1.1 Installation Location, History, and Current Mission

Altus AFB is located in Jackson County in southwestern Oklahoma, 140 miles southwest of Oklahoma City, Oklahoma, and 60 miles west of Lawton, Oklahoma. Altus AFB, consisting of approximately 3,875 acres, is located on the eastern edge of the City of Altus, Oklahoma.

The evolution of Altus AFB began during World War II when the base was established by the War Department on June 17, 1942. Designated as Altus Army Air Field, the installation served as an advanced flying training school for twin engine aircraft during the war. In May 1945, the base was deactivated by the US Army. In September 1948, the War Assets Department turned over the installation to the City of Altus and it became the Altus Municipal

Airport. In January 1953, the base was reactivated and eventually placed under the Strategic Air Command (SAC) which assumed full control in June 1954. SAC flew B-47s and KC-97s until 1958 when they were replaced by B-52s and KC-135s (USAF 2002a).

In July 1968, control of Altus AFB was transferred to the Military Airlift Command (MAC). The KC-135s continued their air refueling mission at the base through tenant units. In May 1969, MAC transferred the 433rd Military Airlift Wing (433 MAW) from Tinker AFB, Oklahoma, to Altus AFB. The 433 MAW's mission was to train C-141 and C-5 air crews. MAC was redesignated as the Air Mobility Command (AMC) in June 1992. The 443 MAW and the 340th Air Refueling Wing merged to form the 97 AMW and were incorporated into AMC. On July 1, 1993, the 97 AMW was realigned under AETC, with responsibility for formal aircrew training in C-5, C-141, and KC-135 aircraft (USAF 2002a).

The 97 AMW's mission is to operate AETC's strategic airlift and aerial refueling flying training schools, to provide airlift and air refueling support for the Joint Chiefs of Staff Single Integrated Operations Plans, to maintain and support C-5, KC-135, and C-17 aircraft, and to serve as the aerial port of embarkation for the US Army at Fort Sill, Oklahoma (USAF 2002a).

3.1.2 Noise

3.1.2.1 Definition of Resource

Noise is considered to be unwanted sound that interferes with normal activities or otherwise diminishes the quality of the environment. It may be intermittent or continuous, steady or impulsive. It may be stationary or transient. Stationary sources are normally related to specific land uses, e.g., housing tracts or industrial plants. Transient noise sources move through the environment, either along established paths (e.g., highways, railroads, and MTRs), or randomly. There is wide diversity in responses to noise that not only vary according to the type of noise and the characteristics of the sound source, but also according to the sensitivity and expectations of the receptor, the time of day, and the distance between the noise source (e.g., an aircraft) and the receptor (e.g., a person or animal).

The physical characteristics of noise, or sound, include its intensity, frequency, and duration. Sound is created by acoustic energy, which produces minute pressure waves that travel through a medium, like air, and are sensed by the ear drum. This may be likened to the ripples in water that would be produced when a stone is dropped into it. As the acoustic energy increases, the intensity or amplitude of these pressure waves increase, and the ear senses louder noise. The unit used to measure the intensity of sound is the decibel (dB). Sound intensity varies widely (from a soft whisper to a jet engine) and is measured on a logarithmic scale to accommodate this wide range. The logarithm, and its use, is nothing more than a mathematical tool that simplifies dealing with very large and very small numbers. For example, the logarithm of the number 1,000,000 is 6, and the logarithm of the number 0.000001 is -6 (minus 6). Obviously, as more zeros are added before or after the decimal point, converting these numbers to their logarithms greatly simplifies calculations that use these numbers. Sound levels are easily measured, but the variability is subjective and physical response to sound complicates the analysis of its impact on

people. People judge the relative magnitude of sound sensation by subjective terms such as "loudness" or "noisiness." The subjective effect of changes in sound pressure level are shown below:

Change in Sound Level (dB)	Change in Power		Change in Apparent Loudness
	Decrease	Increase	
3	1/2	2	Just perceptible
5	1/3	3	Clearly noticeable
10	1/10	10	Half or twice as loud
20	1/100	100	Much quieter or louder

Source: Bies and Hansen 1988

The frequency of sound is measured in cycles per second, or hertz (Hz). This measurement reflects the number of times per second the air vibrates from the acoustic energy. Low frequency sounds are heard as rumbles or roars, and high frequency sounds are heard as screeches. Sound measurement is further refined through the use of "A-weighting." The normal human ear can detect sounds that range in frequency from about 20 Hz to 15,000 Hz. However, all sounds throughout this range are not heard equally well. Therefore, through internal electronic circuitry, some sound meters are calibrated to emphasize frequencies in the 1,000 to 4,000 Hz range. The human ear is most sensitive to frequencies in this range, and sounds measured with these instruments are termed "A-weighted", and are shown in terms of A-weighted decibels (dBA).

The duration of a noise event, and the number of times noise events occur are also important considerations in assessing noise impacts. As a basis for comparison when noise levels are considered, it is useful to note that at distances of about three feet, noise from normal human speech ranges from 63 to 65 dB, operating kitchen appliances range from about 83 to 88 dB, and rock bands approach 110 dB.

The word "metric" is used to describe a standard of measurement. As used in environmental noise analysis, there are many different types of noise metrics. Each metric has a different physical meaning or interpretation and each metric was developed by researchers attempting to represent the effects of environmental noise.

The metrics supporting the assessment of noise from aircraft operations associated with the proposals assessed in this document are the maximum sound level (L_{max}), the Sound Exposure Level (SEL), and Day-Night Average Sound Levels. Each metric represents a "tier" for quantifying the noise environment, and is briefly discussed below.

Maximum Sound Level

The L_{max} metric is used to define peak noise levels. L_{max} is the highest sound level measured during a single noise event (e.g., an aircraft overflight), and is the sound actually heard by a person on the ground. For an observer, the noise level starts at the ambient noise level, rises up to the maximum level as the aircraft flies closest to the observer, and returns to the ambient level as the aircraft recedes into the distance. Maximum sound level is important in judging the interference caused by a noise event with conversation, sleep, or other common activities.

In this document, noise from aircraft operating both around airfields and in military training airspace is considered. Around airfields, the primary operational modes of aircraft are approaches and departures. Table 3-1 shows L_{max} values at various distances associated with typical military and civilian aircraft operating at the military and civilian airfields associated with the proposals addressed in this document.

Table 3-1 Representative Maximum Sound Levels

Aircraft and Power Type	**L_{max} Values (in dBA) At Varying Distances (In Feet)**					
	500	1,000	2,000	3,000	5,000	10,000
C-5 Takeoff	114.2	106.3	97.2	91.0	82.5	69.8
C-5 Landing	112.2	104.5	95.5	89.1	79.5	61.7
C-17 Takeoff	101.8	94.5	86.6	81.4	74.8	65.0
C-17 Landing	89.3	81.3	72.5	67.2	60.4	50.2
KC-135R Takeoff	93.9	87.1	79.8	75.2	68.9	59.1
KC-135R Landing	90.4	83.4	75.8	70.9	64.4	54.2
Boeing 727 Takeoff	107.2	100.3	93.0	88.2	81.9	72.3
Boeing 727 Landing	86.6	79.4	71.8	66.9	60.5	50.6
Boeing 737 Takeoff	110.8	104.0	96.7	92.0	85.8	76.3
Boeing 737 Landing	85.4	77.3	69.7	64.8	58.3	48.4
Lear Jet 25 Takeoff	109.5	102.3	94.4	89.2	82.1	71.0
Lear Jet 25 Landing	83.8	76.7	68.8	63.5	56.4	45.2

Source: OMEGA108

Sound Exposure Level

L_{max} alone may not represent how intrusive an aircraft noise event is because it does not consider the length of time that the noise persists. The SEL metric combines both of these characteristics into a single measure. It is important to note, however, that SEL does not directly represent the sound level heard at any given time, but rather provides a measure of the total exposure of the entire event. Its value represents all of the acoustic energy associated with the event, as though it was present for one second. Therefore, for sound events that last longer than one second, the SEL value will be higher than the L_{max} value. The SEL value is important because it is the value used to calculate other time-averaged noise metrics. Table 3-2 shows SEL values corresponding to the aircraft and power settings reflected in Table 3-1.

Table 3-2 Representative Sound Exposure Levels

Aircraft and Power Type	SEL Values (in dBA) At Varying Distances (In Feet)					
	500	1,000	2,000	3,000	5,000	10,000
C-5 Takeoff	119.6	113.5	106.2	101.0	93.8	83.0
C-5 Landing	115.2	109.3	102.1	96.8	88.5	72.6
C-17 Takeoff	105.5	100.0	93.9	89.8	84.5	76.5
C-17 Landing	94.3	88.0	81.1	76.8	71.3	63.0
KC-135R Takeoff	97.2	92.2	86.7	83.1	78.2	70.2
KC-135R Landing	96.0	90.8	85.0	81.2	76.0	67.6
Boeing 727 Takeoff	111.8	106.7	101.2	97.4	92.5	84.7
Boeing 727 Landing	92.2	86.8	81.0	77.2	72.0	64.0
Boeing 737 Takeoff	115.0	110.0	104.5	100.9	96.0	88.3
Boeing 737 Landing	90.2	84.8	78.9	75.1	69.9	61.8
Lear Jet 25 Takeoff	115.3	110.0	103.9	99.8	94.0	84.6
Lear Jet 25 Landing	90.3	85.0	78.9	74.7	68.9	59.5

Source: OMEGA108

Time-Averaged Cumulative Day-Night Average Noise Metrics

The number of times aircraft noise events occur during given periods is also an important consideration in assessing noise impacts. Two "cumulative" noise metrics support the analysis of multiple time-varying aircraft events. They are the Day-Night Average Sound Level (L_{dn}), and the Onset Rate-Adjusted Monthly Day-Night Average Sound Level (L_{dnmr}).

Day-Night Average Sound Level

This metric (L_{dn}) sums the individual noise events and averages the resulting level over a specified length of time. Thus, it is a composite metric representing the maximum noise levels, the duration of the events, the number of events that occur, and the time of day during which they occur. This metric adds 10 dB to those events that occur between 10:00 P.M. and 7:00 A.M to account for the increased intrusiveness of noise events that occur at night when ambient noise levels are normally lower than during the day time. This cumulative metric does not represent the variations in the sound level heard. Nevertheless, it does provide an excellent measure for comparing environmental noise exposures when there are multiple noise events to be considered.

Onset Rate-Adjusted Monthly Day-Night Average Sound Level

To account for the random and often sporadic nature of military flight training activities in military training airspace, some of the computer programs developed by the Air Force to calculate noise levels created by these activities base their calculations on a monthly, rather than a daily, period. Additionally, to consider some of the unique aspects of noise created by low

altitude, high-speed flight of military aircraft, up to 11 dBA may be added to the calculated noise levels to account for the rapid onset rate of the noise. This sound measurement metric is termed the Onset-Rate Adjusted Monthly Day-Night Average Sound Level, L_{dnmr}. Disregarding the onset-rate adjustment for a moment, it should be noted that arithmetically, calculations of L_{dnmr} will yield the same result as calculations of L_{dn}, as long as the numbers of sound events, or aircraft operations considered, are normalized to monthly as opposed to daily rates.

Finally, it should be noted that ambient background noise is not considered in the aircraft noise calculations that are presented below. There are two reasons for this. First, ambient background noise, even in wilderness areas, varies widely, depending on location and other conditions. For example, studies conducted in an open pine forest in the Sierra National Forest in California have measured up to a 10 dBA variance in sound levels simply due to an increase in wind velocity (Harrison 1973). Therefore, assigning a value to background noise would be arbitrary. Secondly, and probably most important, is that it is reasonable to assume that ambient background noise in the project's ROI would have little or no effect on the calculated Day-Night Average Sound Levels. In calculating noise levels, louder sounds dominate the calculations, and overall, aircraft noise would be expected to be the dominant noise source characterizing the acoustic conditions in the region.

Using measured sound levels as a basis, the Air Force developed several computer programs to calculate noise levels resulting from aircraft operations. Sound levels calculated by these programs have been extensively validated against measured data, and have been proven to be highly accurate.

In this document, the sound levels calculated for aircraft operations in an airfield or landing strip environment are all Daily Day-Night Average Sound Levels (L_{dn}). Sound levels calculated for activities in the military training airspace are all Onset-rate Adjusted Monthly Day-Night Average Sound Levels (L_{dnmr}). Day-Night Average Sound Level metrics are the preferred noise metrics of the Department of Housing and Urban Development (HUD), the Department of Transportation (DOT), the FAA, the EPA, and the Veteran's Administration (VA).

Ignoring the night and onset-rate penalties for the moment, Day-Night Average Sound Level may be thought of as the continuous or cumulative A-weighted sound level which would be present if all of the variations in sound level which occur over the given period were smoothed out so as to contain the same total sound energy. While Day-Night Average Sound Level does provide a single measure of overall noise impact, it is fully recognized that it does not provide specific information on the number of noise events or the specific individual sound levels which occur. For example, a Day-Night Average Sound Level of 65 dB could result from a very few noisy events, or a large number of quieter events. Although it does not represent the sound level heard at any one particular time, it does represent the total sound exposure. Scientific studies and social surveys have found the Day-Night Average Sound Level to be the best measure to assess levels of community annoyance associated with all types of environmental noise. Therefore, its use is endorsed by the scientific community and governmental agencies (ANSI 1980, 1988; EPA 1974; FICUN 1980; FICON 1992).

Annoyance is probably the dominant human reaction to noise. As day-night average noise levels increase, more and more people become "highly annoyed" by the noise. Table 3-3 correlates ranges of day-night average noise levels with the percentage of the population that would be expected to be highly annoyed by those levels. It should be noted that the noise levels shown are outdoor noise levels. For people inside buildings, exposure would be lower because structures attenuate the noise.

Table 3-3 Percent of Population Expected to be Highly Annoyed by Noise

Day-Night Average Noise (L_{dn})	Percent Highly Annoyed
<65	< 12
65 – 70	12 – 22
70 – 75	22 – 36
75 – 80	36 – 54
80 – 85	54 – 70
>85	> 70

Source: Finegold et al. 1994

Additional technical information on the methodology and concept of noise measurement and modeling, additional data on noise effects, and guidelines on appropriate land uses in areas exposed to elevated noise levels can be found in Appendix A.

Aircrews at Altus AFB conduct training at Altus, other military and civilian airfields in the area around Altus, and in regional military training airspace [Military Training Routes (MTRs) and Drop Zones (DZs)]. The Region of Influence (ROI) for the noise assessments in this document are the areas around these locations where training is conducted that are exposed to aviation-related noise resulting from training activities.

Aircraft Activity

Noise exposure around airfields and in the regions underlying military training airspace results from aviation activities. The following terms are defined to provide a better understanding of how data are developed for input to the various noise models used to calculate noise.

Around an airfield, **aircraft operations** are categorized as takeoffs, landings, or closed patterns (which could include activities referred to as touch-and-gos or low approaches). Each takeoff or landing constitutes one operation. A **closed pattern** occurs when the pilot of the aircraft approaches the runway as though planning to land, but then applies power to the aircraft and continues to fly as though taking off again. The pilot then flies a circular or rectangular track around the airfield, and again approaches for landing. In some cases the pilot may actually land on the runway before applying power, or in other cases the pilot simply approaches very close to the ground. In either event, since a closed pattern operation essentially consists of a landing and a takeoff, it is considered two operations.

A **sortie** is defined as a takeoff, performance of a mission, and a landing. However, during mission performance, the aircraft may fly in several elements of airspace. For noise analyses, each training event in each specific element of airspace is considered a sortie in that airspace. This is often termed a **sortie-operation** in the airspace to differentiate it from sorties conducted from the installation. As a result, cumulative use (i.e., the total number of sortie-operations) for all airspace elements will usually add up to more than the number of sorties flown from the base.

Ground-Based Activity

Some additional noise results from day-to-day activities associated with operations and maintenance tasks conducted at Altus AFB, and the industrial functions associated with the operation of the other three airports addressed in this document. These noise sources include the operation of ground-support equipment, and other transportation noise from vehicular traffic. However, this noise is generally localized in industrial areas on the airports, or on established lines of communication supporting traffic to-and-from the airports. Noise resulting from aircraft operations remains the dominant noise source in the airport region.

Because of its nature, the military training airspace associated with aircrew training at Altus AFB overlies more remote and sparsely populated areas. No major ground-based noise sources would be expected in these regions.

3.1.2.2 Existing Conditions at Altus Air Force Base

In May 2002, an Environmental Impact Statement (EIS) was prepared assessing the proposed *Airfield Repairs, Improvements, and Adjustments to Aircrew Training for Altus Air Force Base Oklahoma*. That EIS assessed an annual rate of approximately 145,000 operations. Data associated with this assessment constitute a “Baseline Position” from which subsequent actions and activities will be assessed.

Considering all types of flight activities, a scenario representing an “average day’s” operations was developed. The operations considered include arrivals (landings), takeoffs (departures), and closed patterns around the airfield. Noise calculations consider the frequency of flight operations, runway utilization, and the flight tracks and flight profiles flown by each aircraft. The numbers and types of representative operations addressed are shown in Table 3-4.

These levels and types of activity are then combined with information on climatology, maintenance activities (e.g., engine run-ups, engine maintenance, etc., conducted both on the flight line and in hush houses), and aircraft flight parameters, and processed through the Air Force's BASEOPS/NOISEMAP (Moulton 1990) computer models to calculate L_{dn}. Once noise levels are calculated, they are plotted on a background map in 5-decibel increments from 65 dBA to 85 dBA, as applicable. The land area encompassed by each contour and the population exposed to elevated noise levels (>65 L_{dn}) is shown in Table 3-5.

Table 3-4 Average Daily Operations, Altus Air Force Base, 2002

Aircraft	Arrivals		Departures		Closed Patterns[1]	
	Day	Night	Day	Night	Day	Night
C-5	3.88	1.84	3.88	1.84	11.41	7.54
C-17	19.53	3.19	21.10	1.62	119.23	16.32
KC-135R	14.22	2.72	16.78	0.17	55.40	3.84
C-141	2.00	2.00	4.00	0.00	22.13	2.50
Transients	1.03	0.00	1.03	0.00	0.00	0.00
Total	**40.66**	**9.75**	**46.79**	**3.63**	**208.17**	**30.20**

Source: AETC 2002

Note: Daily operations are based on averages of annual operations; therefore, numbers do not round.

[1] - Since closed patterns are essentially an arrival and takeoff, the 238.37 closed patterns shown equate to 476.74 aviation operations.

Table 3-5 Land Area And Population Exposed to Indicated Sound Levels, Baseline Conditions, Altus Air Force Base

Condition	Day-Night Average Noise Level (L_{dn}dBA)				
	65 - 70	70 - 75	75 - 80	>80	Total
On Altus AFB					
Acres	293	332	712	2,128	**3,465**
Population	650	365	217	31	**1,263**
Persons Annoyed [1]	110	106	98	19	**333**
Off Altus AFB					
Acres	14,211	9,475	4,497	1,050	**29,233**
Population	396	161	84	0	**641**
Persons Annoyed [1]	67	47	38	0	**152**

Source: AETC 2002
Note: [1] Estimated based on average annoyance levels for indicated exposure.

As a result of the environmental documentation developed for the 2002 EIS, three noise exposure mitigation measures were developed and documented in the Record of Decision for the EIS. These included two which affect C-5 operations and one which affects all aircraft operations at Altus AFB. They are summarized below:

- For C-5 closed pattern operations on the east runway (17L/35R) the pilot will climb straight out to 1,500 feet AGL prior to commencing the downwind turn for closed patterns on the outside runway.

- The number of C-5 sorties will be reduced by approximately 33 percent, and the number of C-5 operations around the airfield will be reduced by approximately 28 percent.

- The precision approach glide slope on the west runway (17R/35L) will be changed from 2.5 degrees to 3.0 degrees. This means that aircraft will remain at a higher altitude for a longer period of time while approaching the runway.

As a result of the implementation of these mitigation measures, an "Updated Baseline" for operations at Altus AFB has been developed. Furthermore, during the period from the completion of the 2002 EIS, C-141 aircraft have been deleted from the United States Air Force inventory. As a result, the total annual number of aviation operations conducted at Altus AFB was reduced to approximately 127,000. The average daily operations and noise contours associated with this Updated Baseline are shown in Table 3-6 and Figure 3-1, respectively. Overall, average daily operations were reduced from 577.57 to 503.99, an approximate 13 percent reduction. Table 3-7 shows the land areas and population exposed to elevated noise under this Updated Baseline condition. The Updated Baseline will serve as the basis for comparison for proposed actions assessed in this document.

Table 3-6 Average Daily Operations, Updated Baseline, Altus Air Force Base

Aircraft	Arrivals		Departures		Closed Patterns[1]	
	Day	Night	Day	Night	Day	Night
C-5	2.61	1.22	2.60	1.23	7.66	5.02
C-17	19.53	3.19	21.10	1.62	119.23	16.32
KC-135R	14.22	2.72	16.78	0.17	55.40	3.84
Transients	1.03	0.00	1.03	0.00	0.00	0.00
Total	**37.39**	**7.13**	**41.51**	**3.02**	**182.29**	**25.18**

Note: Daily operations are based on averages of annual operations; therefore, numbers do not round.
1 - Since closed patterns are essentially an arrival and takeoff, the 207.47 closed patterns shown equate to 414.94 aviation operations.
Source: AETC 2002

Table 3-7 Land Area Exposed to Indicated Sound Levels, Updated Baseline Conditions, Altus Air Force Base

Condition	Day-Night Average Noise Level (L_{dn}dBA)					
	65-70	70-75	75-80	80-85	85+	Total
On Altus AFB						
Acres	301.5	298.6	730.0	959.8	1,101.3	**3,391.2**
Population [1]	207	263	447	447	653	**2,017**
Persons Annoyed [2]	35	76	201	277	457	**1,046**
Off Altus AFB						
Acres	10,189.7	8,186.4	2,164.1	617.0	18.4	**21,175.6**
Population [1]	258	200	87	47	0	**592**
Persons Annoyed [2]	44	58	39	29	0	**170**

Note: [1] Population exposed is estimated based on census tract population data, and the relative proportion of the tract encompassed by the indicated noise levels.
[2] Persons expected to be annoyed is estimated based on total population exposed, and the average percentage of that population expected to be annoyed by the indicated noise level (see Table 3-3).
Sources: NOISEMAP; USCB 2002

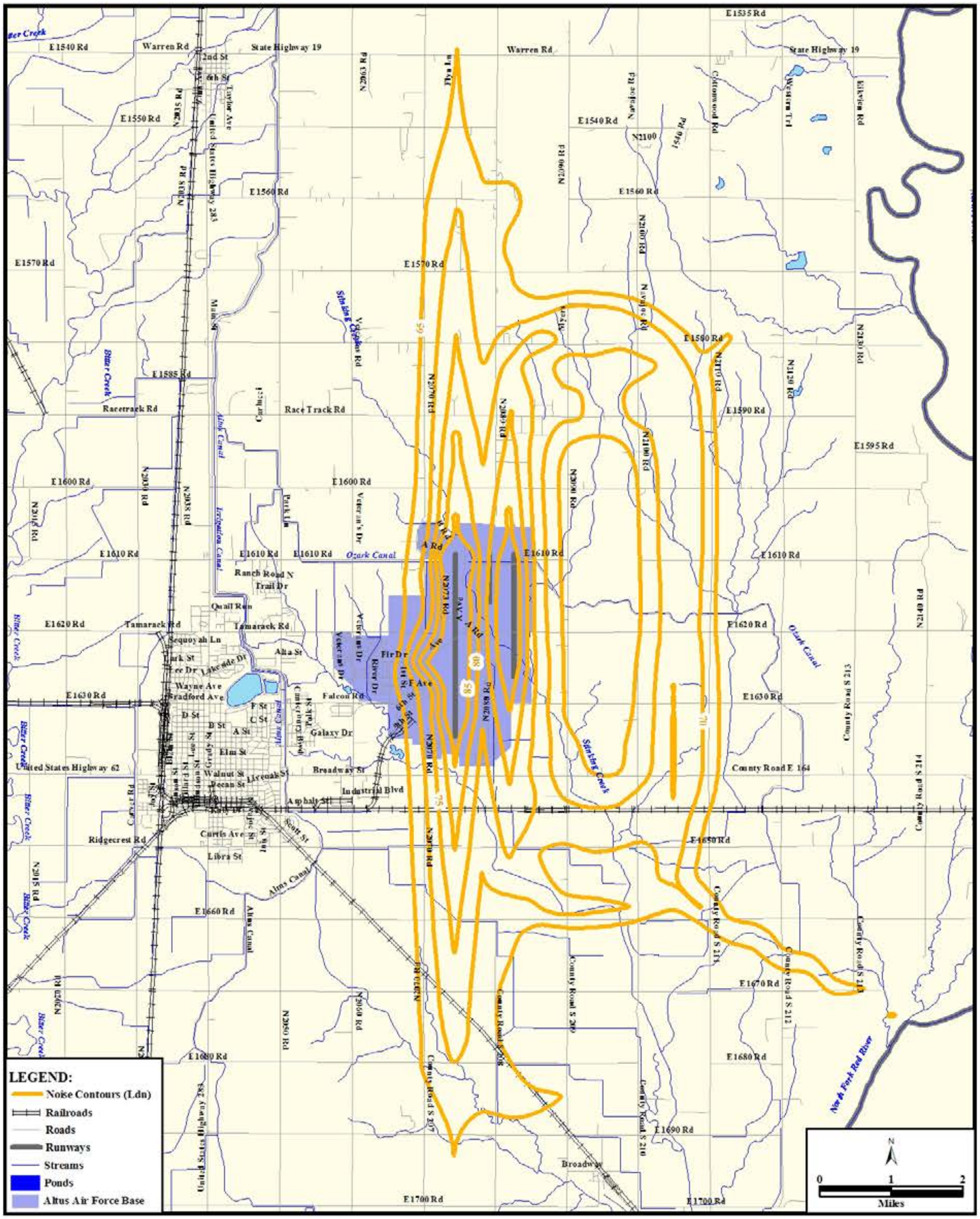


Figure 3-1 Updated Baseline Noise Contours, Altus Air Force Base

As shown in Table 3-7, total land area exposed to elevated noise levels is 24,567 acres. Compared to previous conditions, this reflects a reduction in exposure of 8,131 acres (approximately 25 percent). This resulted from implementation of the mitigation measures described above, and the cessation of C-141 operations at the installation. Although noise exposure has been generally reduced, some land uses remain exposed to noise levels above 65 dBA. The flight tracks of aircraft flown at, and in the immediate vicinity of Altus AFB, are shown in Figure 3-2.

3.1.2.3 Military Training Routes

Aircrews from Altus AFB perform training in regional military airspace. This airspace includes MTRs.

MTRs are designated flight corridors, geographically described by points that form a center line, with lateral extensions on either side of that centerline. These routes are usually flown at low altitudes. There are three types of MTRs, designated as SRs, VRs, and IRs. SRs are only authorized for use by aircraft flying at airspeeds of 250 knots (nautical miles per hour) or less. VRs are flown under visual meteorological conditions using visual flight rules. IRs are flown using instrument flight rules.

Although MTRs are defined by specific geographic points forming a centerline, studies have shown that aircrews do not always follow a specific ground track when using the MTR. Instead, observed flight tracks occur dispersed on either side of the centerline, in a manner that approximates a standard normal distribution. In fact, as route width increases on either side of the route centerline, the standard deviation associated with the distribution around the centerline increases.

Using the Air Force’s program MR_NMAP, which is specifically designed to consider the unique aspects of flight within these elements of military training airspace, the maximum noise levels associated with use of the airspace were calculated. These levels are shown in terms of Monthly Onset-Rate Adjusted Day-Night Average Sound Levels (L_{dnmr}). The calculated noise levels in these airspace elements under current conditions are presented in Table 3-8.

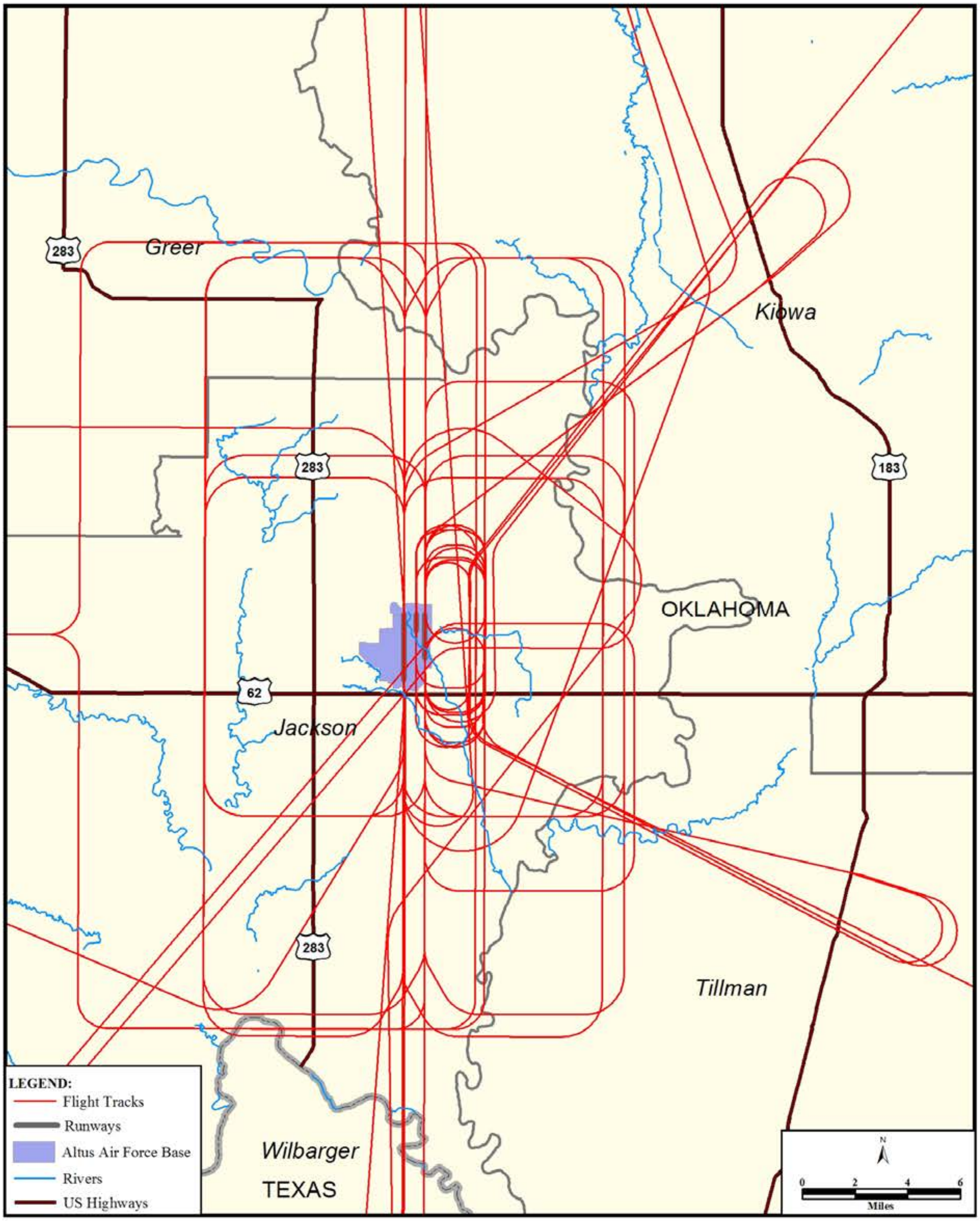


Figure 3-2 Aircraft Flight Tracks, Altus Air Force Base

Table 3-8 Noise Levels Along Military Training Routes Under Current Conditions

Route	Segment	Sound Level In L_{dnmr}
SR-205	A-B	30
	B-E	28
SR-206	A-B	30
	B-E	28
SR-208	A-B C-F	28
	B-C	31
SR-216	All	38
SR-217	A-C D-G	48
	C-D	50
VR-144	A-C E-F	38
	C-E	35
VR-184	A-B D-F	48
	B-D	45
VR-190	All	48
VR-191	All	39
VR-198	A-B C-K	28
	B-C	25
VR-199	A-I J-K	28
	I-J	25
IR-103	A-D	32
	D-F	37
IR-154	All	29
IR-155	A-B	31
	B-K	29
	K-N	31

Source: MR_NMAP
Note: For MTRs, levels reflect the range of values along the entire route

The values presented in Table 3-8 reflect the mathematically calculated output of the MR_NMAP model. However, background noise in rural areas is normally considered to be approximately 40 dBA or greater. Therefore, although a value is calculated, any such value equal to, or less than 35-40 dBA essentially indicates that there is little or no observable noise contribution from aircraft in the region. These low values are due to the relatively limited number of operations in the airspace.

3.1.3 Air Quality

Air quality can be defined as the existing ambient concentrations of various pollutants. This section will describe the air quality surround each of the regions of influence, and the climatic and meteorological conditions that influence the quality of the air. Precipitation, wind direction, wind speed, and atmospheric stability are factors that determine the extent of pollutant dispersion.

The ROI for Altus AFB includes the area around the installation in Jackson County, Oklahoma.

3.1.3.1 Meteorology

The meteorological conditions in the vicinity of Altus AFB are extremely diverse. Location is an important factor in regional weather conditions. Maritime tropical air masses from the Gulf of Mexico move seasonally over the eastern portion of North America. The north-central part of Mexico spawns dry, hot continental air masses. These two air masses dominate the weather activity of southwestern Oklahoma, which may change suddenly and with little warning.

The average annual mean temperature for Altus AFB is 62 degrees Fahrenheit (°F). The average temperature during the summer months is 83°F with record extremes ranging from 49°F to 116°F. The average mean temperature during the winter is 38°F with record extremes ranging from -4°F to 91°F. Altus AFB averages 24 days per year with temperatures in excess of 100°F and 94 days with temperatures above 90°F. Sub-freezing temperatures occur an average of 73 days per year with 3 days per year reaching below 10°F (USAF 1993a).

The average annual relative humidity is 72 percent in the morning and 46 percent in early afternoon. The climate of Altus AFB is described as humid and subtropical, with the greatest amounts of rainfall occurring during the warmest 6 months of the year. Mean precipitation is 24.7 inches per year, with May being the wettest month and January the driest. Mean snowfall averages 7 inches per year with most occurring in February (USAF 1993a).

The predominant wind direction is from the southeast. The average wind velocity is 6 knots, with a maximum-recorded wind speed of 82 knots. Thunderstorms occur an average of 46 days per year. Fog, with accompanying visibility of less than 7 miles, occurs an average of 69 days per year, with extremes of 8 days per month from December through March. Ceilings of less than 3,000 feet and/or visibility of less than 3 statute miles occur

11 percent of the year. Ceilings of less than 1,000 feet and/or visibility of less than 2 statute miles occur 5 percent of the year. Ceilings of less than 200 feet and/or visibility of less than ½ statute mile occur 0.6 percent of the year. The lowest ceilings and worst visibility consistently occur during February (USAF 1993a).

3.1.3.2 Air Pollutants and Regulations

The USEPA has established primary and secondary National Ambient Air Quality Standards (NAAQS) under the provisions of the Clean Air Act of 1970 (CAA). The CAA not only established the NAAQS, but also set emission limits for certain air pollutants from specific sources, set new source performance standards based on best demonstrated technologies, and established national emissions standards for hazardous air pollutants.

The CAA specifies two sets of standards – primary and secondary – for each regulated air pollutant. Primary standards define levels of air quality necessary to protect public health, including the health of sensitive populations such as people with asthma, children, and the elderly. Secondary standards define levels of air quality necessary to protect against decreased visibility and damage to animals, crops, vegetation, and buildings. Federal air quality standards are currently established for six pollutants (known as criteria pollutants), including carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), sulfur oxides (SO_x, commonly measured as sulfur dioxide – SO_2), lead, and particulate matter equal to or less than 2.5 micrometers in aerodynamic diameter ($PM_{2.5}$).[1] Although O_3 is considered a criteria pollutant and is measurable in the atmosphere, it is often not considered as a pollutant when reporting emissions from specific sources, because O_3 is not typically emitted directly from most emissions sources. It is formed in the atmosphere from its precursors, nitrogen oxides (NO_x) and volatile organic compounds (VOCs), which are directly emitted from various sources. Thus, emissions of NO_x and VOCs are commonly reported and controlled as precursor pollutants instead of O_3.

The EPA Office of Air Quality Planning and Standards has set national ambient air quality standards for the six criteria pollutants (see Table 3-9). Units of measure for the standards shown in this table are micrograms per cubic meter of air ($\mu g/m^3$), except for ozone, which is in parts per million (ppm).

The EPA classifies the air quality within an Air Quality Control Region (AQCR) according to whether the region meets federal primary and secondary air quality standards. An AQCR or portion of an AQCR may be classified as attainment, non-attainment, or unclassified with regard to the air quality standards for each of the six criteria pollutants. "Attainment" describes a condition in which standards for one or more of the six pollutants are being met in an area. The area is considered an attainment area for only those criteria pollutants for which the national standards are being met. "Nonattainment" describes a

[1] Air quality standards for particulate matter (PM) that were promulgated on July 18, 1997, changed the aerodynamic diameter from 10 micrometers to 2.5 micrometers.

Table 3-9 National Ambient Air Quality Standards

Pollutant	Standard Value ($\mu g/m^3$)[a]	Standard Type
CO		
1 hr average	40,000	Primary
8 hr average	10,000	Primary
NO_2		
Annual average	100	Primary and secondary
O_3		
1 hr average	0.12	Primary and secondary
8 hr average[b]	0.08	Primary
Lead		
Quarterly average	1.5	Primary
PM_{10}		
24 hr average[c]	150	Primary and secondary
Annual average[d]	50	Primary and secondary
$PM_{2.5}$		
24 hr average[e]	65	Primary
Annual average[f]	15	Primary
SO_2		
3 hr average	1,300	Secondary
24 hr average	365	Primary
Annual average	80	Primary

Source: USAF 2002a

[a] Except for ppm for ozone.
[b] New ozone 8 hr standard does not become effective until area demonstrates compliance with existing 1 hr standard.
[c] Existing 24 hr standard for particulate matter equal to or less than 10 micrometers in aerodynamic diameter (PM_{10}) will remain in effect but will be adjusted to 99th percentile of concentrations within an area.
[d] Existing PM_{10} annual standard will remain in effect as is.
[e] New $PM_{2.5}$ 24 hr standard is based on 98th percentile of concentrations over 1 year (averaged over 3 years) at population-oriented monitors using highest measured values.
[f] New $PM_{2.5}$ annual standard is based on 3-year average of annual arithmetic means.

condition in which standards for one or more of the six pollutants are not being met in an area. “Unclassified” indicates that air quality in the area cannot be classified and the area is treated as attainment. An area may have all three classifications for different criteria pollutants.

Section 162 of the CAA further established the goal of prevention of significant deterioration (PSD) of air quality in all international parks; national parks which exceeded 6,000 acres; and national wilderness areas which exceeded 5,000 acres if these areas were in existence on August 7, 1977. These areas were defined as mandatory Class I areas, while all other attainment or unclassifiable areas were defined as Class II areas. Under CAA Section 164, states or tribal nations, in addition to the federal government, have the authority to redesignate certain areas as (non-mandatory) PSD Class I areas, i.e., a National Park or national wilderness area established after August 7, 1977, which exceeds 10,000 acres. PSD Class I areas are areas where any appreciable deterioration of air quality is

considered significant. Class II areas are those where moderate, well-controlled growth could be permitted. Class III areas are those designated by the governor of a state as requiring less protection than Class II areas. No Class III areas have yet been so designated.

CAA Section 169A established the additional goal of prevention of further visibility impairment in the PSD Class I areas. Visibility impairment is defined as a reduction in the visual range and atmospheric discoloration. Determination of the significance of an activity on visibility in a PSD Class I area is typically associated with evaluation of stationary source contributions. The EPA is implementing a Regional Haze rule for PSD Class I areas that will address contributions from mobile sources and pollution transported from other states or regions. Emission levels are used to qualitatively assess potential impairment to visibility in PSD Class I areas. Decreased visibility may potentially result from elevated concentrations of PM_{10} and SO_2 in the lower atmosphere. The nearest PSD Class I area to Altus AFB is the Wichita Mountains Wilderness, which is located approximately 30 miles east of Altus AFB.

Air quality management at Air Force installations is established in AFI 32-7040, *Air Quality Compliance*. AFI 32-7040 requires installations to achieve and maintain compliance with all applicable federal, state, and local standards for air quality compliance. Air quality compliance involves prevention, control, abatement, documentation, and reporting of air pollution from stationary and mobile sources. Maintaining compliance with air quality regulations may require reduction or elimination of pollutant emissions from existing sources, and control of new pollution sources (USAF 1994a).

Altus AFB has obtained an operating permit from the Oklahoma Department of Environmental Quality (ODEQ), for the applicable stationary sources, such as boilers, fuel storage tanks, surface coating operations, etc. Altus AFB has agreed to certain limits on throughput and usage rates to effectively limit the potential emissions to below major source levels, which is called a “synthetic minor” permit under Title V of the CAA of 1990. This permit must be renewed every five years, or modified if a qualifying event, such as removal, replacement, or addition of a permitted source, occurs.

3.1.3.3 Regional Air Quality

Altus AFB is located within the southwestern Oklahoma Intrastate AQCR 189. The air quality in the region is generally good. All 12 counties within AQCR 189 are classified by the EPA as attainment or unclassified for all criteria pollutants. A review of recent (1998 and 1997) air quality data from AQCR 189 showed no exceedances of the air quality standards for the monitored pollutants (CO, NO_2, O_3, and PM_{10}) (USAF 2002a).

Portions of all MTRs are located within the boundaries of AQCRs 187 and 210. All counties within these AQCR are classified by the EPA as attainment or unclassified for all criteria pollutants.

3.1.4 Earth Resources

Earth resources include topography, geology, and soils. Geologic resources of an area typically consist of surface and subsurface materials and their inherent properties. The term soils refers to unconsolidated materials formed from the underlying bedrock or other parent material. Soils play a critical role in both the natural and human environment. Soil drainage, texture, strength, shrink-swell potential, and erodibility all determine the suitability of the ground to support man-made structures and facilities. These resources may have scientific, historical, economic, and recreational value. The ROI for earth resources includes the area immediately underlying the proposed and alternative sites at Altus AFB.

3.1.4.1 Geology

According to the Jackson County Soil Survey, the surface rocks in the vicinity of Altus AFB belong to three geologic systems: the Recent and Quaternary deposits, and Hennessey shale. The Recent formations are the alluvium of floodplains along the major streams that are subject to overflow. The Quaternary deposits are composed of loamy and sandy materials. The Hennessey shale consists of red, silty shales and clays, with some siltstone. The uppermost 5 to 40 feet of the Hennessey formation consist primarily of yellowish-gray, buff, tan, orange, yellow, or greenish-gray shale (USAF 2002a).

3.1.4.2 Topography

The topography in the vicinity of Altus AFB consists of flat to gently rolling terrain, interspersed with occasional hills and small mountains. Land features such as solution sinks, canyons, mesas and buttes, and badlands also occur. In general, the land increases in elevation from east to west, and natural elevation ranges from about 1,300 feet to 2,900 feet msl. The Wichita Mountains are located to the northeast, creating a backdrop to the base (USAF 2002a).

3.1.4.3 Soils

Soils in the vicinity of Altus AFB are of two general groups: the Tillman-Hollister association and the Miles-Nobscot association. Within these two associations, the predominant soils in the areas surrounding the base include Tillman and Hollister clay loams (0 to 1 percent slopes), Miles fine sandy loams (0 to 3 percent slopes), Nobscot fine sand (0 to 5 percent slopes), and Altus fine sandy loam (0 to 1 percent slopes) (USDA 1961).

The major soil types found on the Altus AFB airfield are Miles fine sandy loam on the northern sections of the runways, Altus fine sandy loam around the center sections of the runways, and Tillman and Hollister clay loams on the southern sections of the runways. No areas composed of these soil types exceed a 3 percent slope. Miles fine sandy loam is susceptible to wind and water erosion. Tillman and Hollister clay loams are classified as having low erodibility where “erosion is not particularly a hazard.” During prolonged dry periods, however, the fine particles of clay and silt are detached from the soil mass and

easily eroded. The county soil survey suggested the use of best management practices in areas possessing highly erodible soils that are farmed, including water-control devices, field terraces, diversion terraces, waterways, or farm ponds (USDA 1961).

3.1.5 Water Resources

3.1.5.1 Surface Water

Several streams are located on Altus AFB and in the surrounding areas. Stinking Creek flows from the northwest to the southeast, draining the northern and eastern portion of the base and flowing diagonally to the southeast corner of the base. Stinking Creek is a tributary to the North Fork of the Red River, joining the North Fork approximately 13 miles downstream of the base. The creek drains an approximate 27-square-mile area upstream of US Highway 62, which is adjacent to the southern base boundary. It is a perennial stream with a flow of less than 20 cubic feet per second, except during local rainfall (USAF 2002a). An unnamed tributary flows within and adjacent to the eastern property boundary of the base for a distance of approximately 5,000 feet.

An agricultural irrigation canal, the Ozark Canal, enters base property at the northern end near the old Alert area, crossing the airfield below all three runways, and exiting at the easternmost base boundary. The canal's diked banks preclude surface runoff from the base, and the base has no access to its water. The canal is used for agricultural irrigation and may be dry or ponded during the off season.

Surface water quality of the streams in the vicinity of Altus AFB is characterized as being of poor quality, with total dissolved solids concentrations of 1,000 milligrams per liter (mg/L) and higher. Water containing 500 mg/L or less of dissolved solids is generally considered satisfactory for most domestic and industrial uses.

3.1.5.2 Groundwater

The Hennessey Shale group is the only significant hydrologic unit at Altus AFB. The group is exposed at the surface, and includes all the base acreage and areas surrounding the base. Water in the Hennessey Shale is generally unconfined and shallow and is not a major source of water in the Altus AFB area. Yields are generally small, sufficient only for stock and domestic purposes.

Precipitation is the primary source of recharge to the shallow water table. Groundwater storage fluctuates significantly due to seasonal variations and periods of above-average rainfall. When water is available, some local recharge also occurs near an unlined irrigation canal north of the installation (USAF 2002a).

Movement of shallow groundwater at Altus AFB is to the southeast, generally paralleling the surface topography. The surface change of altitude across the base from the northwest to southeast is about 35 to 45 feet. The elevation change varies from approximately 1,375 feet (northwest corner of the existing housing area) and 1,385 feet (northernmost section of the runway) to approximately 1,340 feet in the southeast section

of the base (USGS 1964). This slope is mirrored in the shallow water table, with water level elevations measured in base monitoring wells ranging from about 1,366 feet in the northwest part of the base to about 1,339 feet in the southeast. The hydraulic conductivity of the clay containing the shallow water table was determined to be 3.3 x 10^{-8} feet per second. Measurements at base monitoring wells show that the depth to water ranges from less than 2 feet to over 12 feet below land surface. No natural surface discharge points are known to occur on the base (USAF 2002a).

3.1.6 Hazardous Materials and Wastes

3.1.6.1 Hazardous Materials

Hazardous materials are those substances defined by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act, and the Toxic Substances Control Act. In general, hazardous materials include substances that, because of their quantity, concentration, physical, chemical, or infectious characteristics, may present substantial danger to public health or welfare or to the environment when released or otherwise improperly managed.

Hazardous materials management at Air Force installations is established primarily by AFI 32-7080, *Pollution Prevention Program*, which incorporates the requirements of all federal regulations, AFIs, and DoD Directives (DoDDs), for the reduction of hazardous material uses and purchases. The primary hazardous materials addressed by AFI 32-7080 are ozone depleting chemicals and the 17 chemicals listed under the USEPA Industrial Toxics Program (EPA 17 chemicals). EO 12088, *Federal Compliance with Pollution Control Standards*, under the authority of the USEPA, ensures that necessary actions are taken for the prevention, management, and abatement of environmental pollution from hazardous materials or hazardous waste due to federal facility activities. Altus AFB developed a pollution prevention management plan which requires compliance by all Altus AFB activities. The plan, *Pollution Prevention Management Plan, Altus Air Force Base, Volume I: Basic Plan*, and associated appendices was finalized in December 1993 (USAF 1993c).

Current operations at Altus AFB require the use of numerous hazardous materials. They range from paints to industrial solvents and degreasers. Hazardous materials are also used by on-base contractors supporting base operations. The base requires all contractors using hazardous materials to submit a hazardous materials contingency plan prior to working on base. Spills of hazardous materials and wastes are managed in accordance with the Altus AFB Spill Prevention and Response Plan (USAF 2002a).

3.1.6.2 Hazardous Waste

Hazardous wastes are defined by the Solid Waste Disposal Act as amended by the Resource Conservation and Recovery Act (RCRA), which was further amended by the Hazardous and Solid Waste Amendments. RCRA Subtitle C (40 CFR Parts 260 through 270) regulations are administered by the USEPA and are applicable to the management of

hazardous waste. Regulatory authority is subsequently delegated by the USEPA to the State of Oklahoma. These regulations require that hazardous waste be handled, stored, transported, disposed, or recycled in compliance with applicable regulations.

Altus AFB does not currently maintain any active permitted hazardous waste storage facilities. Building 451 was used in the past for hazardous waste storage, but is in the process of closure and is no longer used. Altus AFB maintains several satellite accumulation points throughout the base in accordance with RCRA and Air Force regulations. Hazardous waste generated in the workplace is temporarily accumulated at a satellite accumulation point located in the vicinity of generation. Upon accumulation limits being reached (typically 55 gallons per hazardous waste stream, or 1 quart for acutely hazardous waste streams), the waste is taken to a "less than 90-day" accumulation site located at Building 502. Wastes may also be taken directly to the accumulation site as they are generated. Within 89 days of arrival at Building 502, the waste is transferred off base to an authorized treatment, storage, or disposal facility under a contract managed by the Defense Reutilization Marketing Office.

Approximately 70,500 pounds of hazardous waste was generated by Altus AFB in CY 96. Hazardous waste was generated primarily from aircraft maintenance operations, spent hazardous materials, and spills. Air Force waste management operations at Altus AFB are registered with the USEPA under identification number OK9571824045 (USAF 2002a).

3.1.6.3 Installation Restoration Program

The DoD implemented the Installation Restoration Program (IRP) to identify the locations and contents of past toxic and hazardous material disposal and spill sites and to eliminate the hazards to public health in an environmentally responsible manner. The objectives of the IRP are to identify and fully evaluate any areas suspected to be contaminated with hazardous materials caused by past Air Force operations, and to eliminate or control any hazards to the public heath, welfare, or the environment. The IRP is the basis for response actions on Air Force installations under provisions of CERCLA, and the Superfund Amendments and Reauthorization Act of 1986, as clarified by EO 12580, *Superfund Implementation*.

A Phase I records search at Altus AFB identified 30 sites or areas of concern, 20 of which were determined to require no further action. The remaining 10 potential sites included four former fire training areas, three former landfills, two former wash rack ponds, and a service station. No sites are located in the vicinity of the proposed project sites.

3.1.6.4 Lead-based Paint and Asbestos

Lead-based paint management at Air Force installations is established in the Air Force policy and guidance on lead-based paint in facilities. The policy incorporates by reference the requirements of 29 CFR 1910.1025, 29 CFR 1926, 40 CFR 50.12, 40 CFR 240 through 280, the CAA, Public Law 102-550, and other applicable federal regulations. This policy

requires each installation to develop and implement a facility management plan for identifying, evaluating, managing, and abating lead-based paint hazards (USAF 2003a).

Lead-based paint activities at Altus AFB are managed by the base Environmental Protection Committee's lead-based paint subcommittee, which has representatives from civil engineering, the medical group, and safety. Lead-based paint detection sampling is accomplished prior to renovation or demolition of a facility. Initial surveys of key and priority facilities have been completed and follow-up monitoring is ongoing at these facilities. Inspection and abatement activities for facilities range from incidental and routine maintenance to full scale abatement in preparation for demolition. If lead-based paint is detected in a building prior to an action and is determined to be a potential hazard or threat, the debris from the demolition or renovation is then disposed of in accordance with applicable federal, state, and local hazardous waste and lead abatement regulations. Lead-based paint is managed according to the base's lead-based paint management plan (USAF 2002a). No lead-based paint is known to occur in any of the facilities included under the proposed action or alternatives.

Asbestos is regulated by the USEPA and Occupational Safety and Health Administration (OSHA). Emissions of asbestos to ambient air are controlled under Section 112 of the CAA. Identification of asbestos-containing material in base facilities is governed by OSHA under the authority of the Occupational Safety and Health Act, 29 USC §§ 669 et seq. The USEPA has a policy that addresses leaving asbestos in place if its disturbance or removal could pose a health threat.

Altus AFB bioenvironmental engineering staff conducts asbestos sampling prior to renovation or demolition of a facility. The samples are sent to a state- or USEPA-certified laboratory for analysis. Asbestos-containing material is disposed of in accordance with RCRA statutes and transported under applicable Department of Transportation regulations. Asbestos management and operations involving asbestos are conducted according to the base's *Asbestos Management Plan* and *Asbestos Operations Plan* (USAF 2002a). No asbestos is known to occur in any of the facilities included under the proposed action or alternatives.

3.1.7 Biological Resources

Biological resources comprising the existing affected environment include vegetation, wildlife threatened or endangered species, wetlands, livestock and other sensitive habitats near the study area. Since the study area includes large areas of similar habitats and since many of these habitats and species are common to all of the areas potentially impacted by the project, general discussions of biological resources will follow. The majority of the area is located on the fringe of the playa lakes region of the High Plains. Playa lakes are flat depressions in the land surface that form shallow lakes during rain or flood events. As summer temperatures increase, the playa lakes quickly dry and leave behind sediment and mineral deposits. The ROI for biological resources encompasses the area of Altus AFB and the MTRs.

3.1.7.1 Vegetation

Vegetation in southwestern Oklahoma and the southeastern corner of the Texas Panhandle consists primarily of brushland areas and grassy plains. Two distinct ecoregions occur in this area. These include mesquite plains and grasslands. The grasslands occur mainly north of the Red River and are characterized by a mix of tall grass vegetation including various species of bluestem, buffalo grass and grama grass. The mesquite plains are located mostly south of the Red River and are dominated by mesquite, various thorny shrubs, buffalo grasses and grama grasses. More specifically, Altus AFB is located within the mixed-grass prairie of the Kansas biotic province. Because of the extreme temperatures, lack of moisture and high salt content clay soils, few native species of trees exist in this area. Native Other vegetative species among the native grasses consist of yucca, mesquite, sagebrush and other xerophytic species. Much of the original native vegetative species have been replaced by introduced species. Most vegetated areas on or adjacent to the base are actively landscaped or mowed. In addition, much of the mixed prairie has been converted to short-grass pasture for livestock grazing. Major crops in the area consist of wheat, cotton, sorghum, and alfalfa. A complete list of plant species and plant communities found on Altus AFB is included in the Oklahoma Biological Survey's endangered species survey for Altus (USAF 2002a).

Forested areas are not common in this area and mostly occur along floodplains of the Red River and its major tributaries. Dominant tree species in the forested areas include tamarisk and willow. However, cottonwood, black willow, American elm, soapberry, and hackberry are common in the floodplains.

3.1.7.2 Wildlife

A diversity of wildlife species are found throughout the ROI. The presence or absence of mammals, birds, amphibians, reptiles and fish is dependent upon habitat and season. Types of habitat can vary considerably within a small area as a result of water availability, elevation, vegetation and soil type.

Mammals. Numerous mammal species occur throughout the ROI. These include opossum, eastern cottontail, mink, common skunk, long-tailed weasel, white-tailed deer, and beaver. Other mammals common to this area include the little brown bat, the Mexican Freetailed bat, chipmunk, nine banded armadillo, chipmunk, prairie dog, white-footed mouse, deer mouse, muskrat and black-tailed jack rabbit (USAF 1996).

The Reed Bat Caves located along Cave Creek between Reed and Vinson, Oklahoma are used by millions of Mexican freetailed bats. The caves serve as a nursery during the summer and are part of a network of caves by bats during migration from Mexico to Kansas (USAF 1996). Five small mammal species are known to occur on Altus AFB. In order of abundance, they consist of hispid cotton rat, white-footed mouse, house mouse, deer mouse, and fulvous harvest mouse. Many other wildlife species exist in the less developed areas adjacent to Altus AFB. Some of the native mammals include fox squirrel, 13-lined ground squirrel, cottontail and jackrabbit, opossum, beaver, several species of mice, mule deer, nine-banded armadillo and coyote (USAF 2002a).

Birds. Most birds occurring in this area are associated with wetland areas and floodplain forests along the major rivers and tributaries. Bird species common to this area include the great blue heron, little blue heron, the great egret, the cattle egret, green-winged teal, mallard northern pintail, gadwall, American widgeon, turkey vulture, American kestrel, red-tailed hawk, northern bobwhite quail, and many other game and non-game species (USAF 2002a).

The ROI is located in the Central Flyway for migrating waterfowl. More than 75,000 geese of various species and more than one million ducks use this corridor (USAF 1996). The floodplains and wetlands along the major rivers and tributaries are inhabited with large numbers of waterfowl during the spring and fall migrations.

Sixty-eight bird species have been recorded on and adjacent to Altus AFB. The most common bird species on the base is the great-tailed grackle, with mourning doves being the second most common. A complete list of bird species found on Altus AFB is included in the Oklahoma Biological Survey's endangered species survey for Altus (USAF 1996).

With the exception of raptors, the remaining more common species are relatively small and fly near the ground surface. Although populations of raptors tend to increase during late fall and winter, this area of Oklahoma is not within a primary raptor migration route but is within the wintering range of many raptors. Although herons and egrets could occur in this area, these species do not occur in great concentrations and are found only near specialized habitat near water. Available maps indicate that suitable habitat on Altus AFB is limited for these species.

Altus AFB has an active Bird-Aircraft Strike Hazard (BASH) plan in effect to minimize aircraft collisions with birds. Bird-aircraft strikes are considered a flight safety issue. The airspace utilized by aircraft performing aerial drop training from Altus AFB has been assessed in regard to bird-aircraft strikes. This analysis concluded that only moderate to occasional bird activity exists in this area. Fifty two percent of the bird-aircraft strikes involving Altus AFB aircraft occur in the traffic pattern at altitudes of 1,000 feet AGL and below, 6 percent of strikes occur on low-level navigation routes, and the altitude and phase of flight for 42 percent of the strikes are unknown (USAF 2002a).

Reptiles and Amphibians. Various amphibians and reptiles occur throughout the ROI, but most are associated with water. The most common species include the common garter snake, common water snake, the bullfrog, the black snake, the common king snake and the common snapping turtle (USAF 1996).

Fish. Common fish species in the ROI include the bullhead the large and small-mouth bass, catfish, crappie white bass and striped bass (USAF 1996). Several aquatic habitats occur in the area of Altus AFB including Stinking Creek, tributaries to Stinking Creek, irrigation channels, and upland drainage ditches. According to the Oklahoma water classification system, Stinking Creek is considered a primary warm-water fishery. However, due to small surface area of the creek near the base and the effects of agricultural

disturbances, no significant game-fish populations are present on Altus AFB (USAF 2002a).

3.1.7.3 Threatened and Endangered Species

A listed species, provided protection under the Endangered Species Act, is so designated because of danger of its extinction as a consequence of economic growth and development without adequate concern and conservation.

There are no state or federal records indicating that endangered or threatened species occur on or near Altus AFB. Two federally listed endangered species are known to exist in Jackson County, the interior least tern (*Sterna antillarum athalassos*) and the whooping crane (Grus americana). However, there are no records of either of these species occurring on or near the base. The interior least tern is known to nest on sandbars along major rivers in Oklahoma during summer months. The whooping crane is known to migrate through the state during spring and fall, using prairie wetland areas and major rivers as stopover sites (USAF 1994a). The bald eagle (*Haliaeetus leucocephalus),* a federally threatened species is the only other federally protected species known from this part of the state. Although they occur in this part of the Oklahoma, they have never been recorded in Jackson or Washita Counties. No areas on or near Altus AFB are likely to attract bald eagles. In 1997, the Oklahoma Biological Survey found it highly improbable that federally listed species would be drawn to Altus AFB given the extent and type of habitats available (USAF 2002a).

There are no federal or state designated critical habitat areas for wildlife in the ROI. However, the Reed Bat Caves area and Sandy Sanders Wildlife Management Area (WMA) are located approximately 30 and 40 miles from the base, respectively. The Reed Bat Caves and surrounding mesquite grasslands located along Cave Creek in Greer and Harmon counties, Oklahoma are sensitive wildlife areas. The caves, grasslands and nearby riparian areas provide important habitat for Mexican free-tailed bats. The Sandy Sanders Wildlife Management Area is located in Beckham and Greer counties, Oklahoma, and is managed by the Oklahoma Department of Wildlife Conservation. This area encompasses canyon lands, numerous small streams and grassy plateaus and is used for outdoor recreation and the management of both game and non-game species.

The Oklahoma Department of Wildlife Conservation (ODWC), OBS, and the USFWS were consulted on the potential for listed threatened, endangered, and candidate species to occur on or migrate through the project area. The correspondence received from these agencies can be found in Appendix B (although the USFWS has deferred comment until receipt of the Draft EA). Although there are no known federal or state listed threatened or endangered plant species located in the immediate project area, several protected species have the potential to occur in Jackson County (USAF 1993a). These species are listed in Table 3-10.

Table 3-10 Federal and State Listed Threatened and Endangered Species, Altus Air Force Base

Scientific Name	Common Name	Status	Occurrence
Dipodomys elator	Texas kangaroo rat	C2	4
Phrynosma comutum	Texas horned lizard	C2	4
Faico peregrinus anatum	American peregrine falcon	E, SE	4
Haliaeetus leucocephalus	Bald eagle	E, SE	4
Sterna antillarum athalassos	Interior least tern	E, SE	4
Grus americana	Whooping crane	E, SE	4
Lanius ludovicianus	Loggerhead shrike	C2	4
Plegadis	White faced ibis	C1	4
Faico peregrinus tundrius	Arctic peregrine falcon	T, SE	4

C1 Category 1 candidate species
C2 Category 2 candidate species
SE State Endangered range
ST State Threatened
E Endangered
T Threatened

1 Known to occur on property
2 Seasonal occurrence
3 Occurrence probable
4 Property is within species range

Source: USAF 1993a

3.1.7.4 Wetlands

Wetlands consist of open, shallow areas that have a predominance of hydric soils that support water tolerant plants. These areas are also characteristically swampy or marshy. Wetlands provide valuable habitat for wildlife, act as water retention basins and filter out sediments. Four federal agencies are responsible for identifying and regulating wetlands: the United States Army Corps of Engineers (COE), the USEPA, the United States Fish and Wildlife Service (USFWS), and the Natural Resource Conservation Service (NRCS). The COE and USEPA are primarily responsible for making jurisdictional determinations and regulating wetlands under Section 404 of the Clean Water Act (CWA). The COE also makes jurisdictional determinations under Section 10 of the Rivers and Harbors Act of 1899. The NRCS has developed procedures for identifying wetlands for compliance with the Food Security Act of 1985, and the USFWS has developed a classification system for identifying wetlands.

The occurrence of wetlands in the ROI is limited to the riverine and floodplain areas associated with the major rivers and tributaries in the study area. Palustrine wetlands are found along the floodplains of the Red River and its associated tributaries. On Altus AFB, the results of a 1994 USACE wetlands survey indicated that there are four main areas of jurisdictional wetlands within the base boundaries. All of these areas are associated with Stinking Creek. Several streambed and bank systems, which are jurisdictional as “other waters of the United States,” are also located on base (USAF 2002a).

3.1.7.5 Floodplains

EO 11988, *Floodplain Management*, May 24, 1977, states that federal agencies “... shall provide leadership and shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and

preserve the natural and beneficial values served by floodplains." The EO requires that an agency shall avoid undertaking or providing assistance for new construction located in floodplains and that if the head of the agency finds that there is no practicable alternative to such construction, the proposed action must include all practicable measures to minimize harm to floodplains, which may result from such use.

The National Flood Insurance Program (NFIP), administered by the Federal Emergency Management Agency (FEMA), was created in 1968 to provide insurance to people who live in areas with the greatest risk of flooding, called Special Flood Hazard Areas (SFHAs). Generally, the SFHAs are those portions of participating communities within the 100-year floodplain. The 100-year floodplain includes land which will be flooded, on an average, once every 100 years.

Figure 3-3 shows the boundaries of the 100-year floodplain on Altus AFB defined from the USACE survey conducted in 1994. The floodplain area located on the northeast portion of the base extends from the north end of the base, runs between the west runway and the Assault Landing Strip to the south, then crosses the east runway and finally exits the base. The 100-year floods are hydrological events of a magnitude expected to be equaled or exceeded once, on the average, during any 100-year period or commonly have a 1 percent chance of being equaled or exceeded during any year. Although the recurrence interval represents the long-term, average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The 100-year floodplain includes land that during such an event would be flooded. The NFIP is effective only for participating communities. The city of Altus is a participant, but Jackson County is not (USAF 2002a).

3.1.8 Cultural Resources

Cultural resources are prehistoric and historic sites, structures, districts, artifacts, or any other physical evidence of human activity considered important to a culture, subculture, or community for scientific, traditional, religious, or any other reason. For ease of discussion, cultural resources have been divided into two categories: 1) archaeological resources (prehistoric, historic, and traditional) and 2) historical resources (historic buildings and structures). Numerous laws and regulations require that possible effects to cultural resources be considered during the planning and execution of federal undertakings. These laws and regulations stipulate a process of compliance, define the responsibilities of the federal agency proposing the action, and prescribe the relationship among other involved agencies [e.g., the State Historic Preservation Officer (SHPO) and the Advisory Council on Historic Preservation (ACHP)]. In addition to the NEPA, the primary laws that pertain to the treatment of cultural resources during environmental analysis are the National Historic Preservation Act (NHPA) (especially Sections 106 and 110), the Archaeological Resources Protection Act, the American Indian Religious Freedom Act, and the Native American Graves Protection and Repatriation Act (NAGPRA).

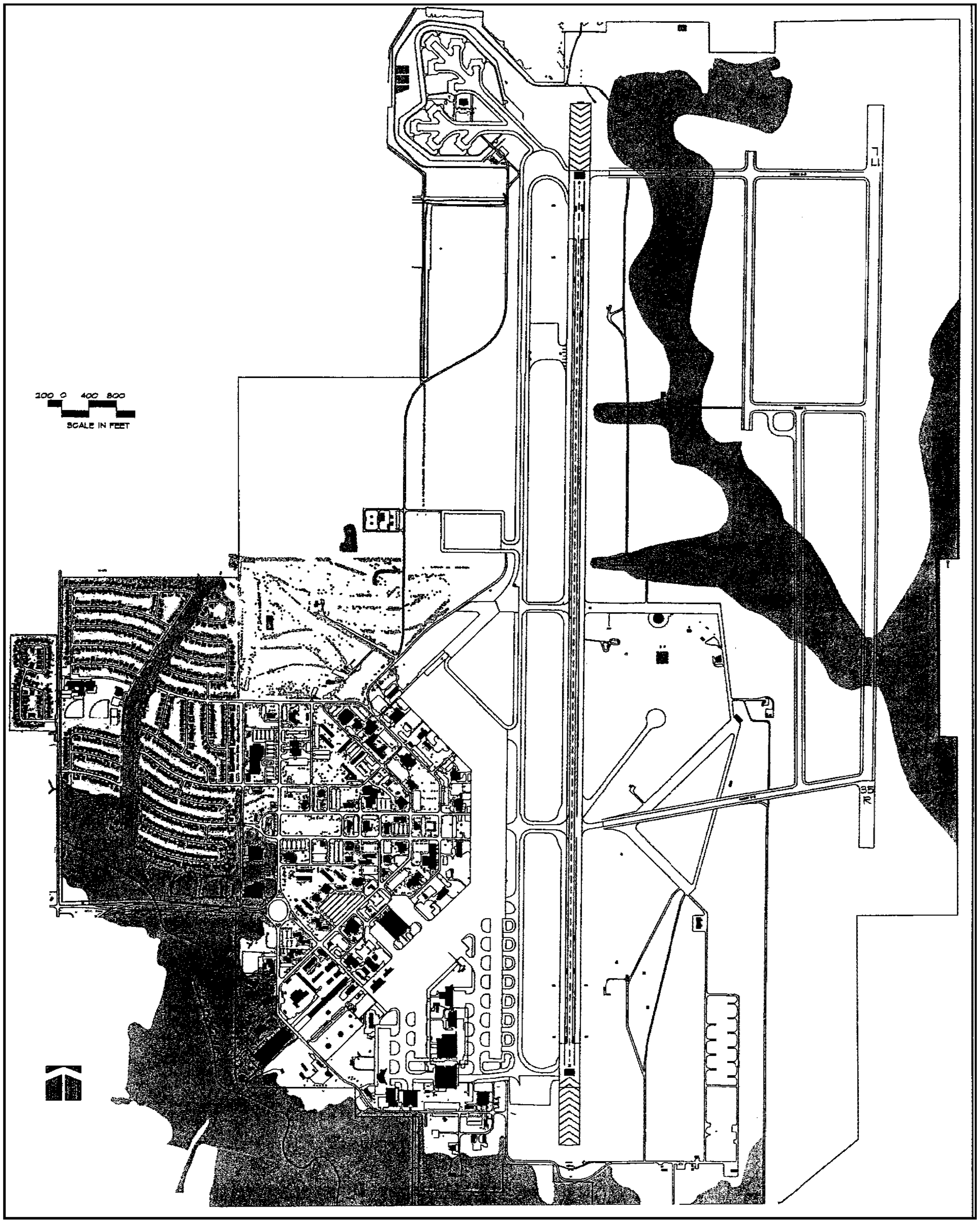


Figure 3-3 100-Year Floodplain, Altus Air Force Base

Only those cultural resources determined to be potentially significant under the given legislation are subject to protection from adverse impacts resulting from an undertaking. To be considered significant, cultural resources must meet one or more of the criteria established by the National Park Service that would make that resource eligible for inclusion in the National Register of Historic Places (NRHP). The term “eligible for inclusion in the National Register” includes both properties formally determined as such by the Secretary of the Interior and all other properties that meet National Register listing criteria, which are specified in Department of Interior regulations (36 CFR 60.4). Therefore, sites not yet evaluated may be considered potentially eligible to the NRHP and, as such, afforded the same regulatory consideration as nominated properties. Whether prehistoric, historic, or traditional, significant cultural resources are referred to as “historic properties.”

Cultural resources management at Air Force installations is established in AFI 32-7065, *Cultural Resources Management*. AFI 32-7065 details the compliance requirements for protecting cultural resources, including the preparation of a Cultural Resources Management Plan (CRMP). The CRMP must include an inventory and evaluation of all known cultural resources; identification of the likely presence of other significant cultural resources; description of installation strategies for maintaining cultural resources and complying with related resource statutes, regulations, policies, and procedures; standard operating procedures and action plans that include budget, staffing, and scheduling activities; clear identification and resolution of the mission impact on cultural resources; and conformance with local, state, and federal preservation programs.

Information on cultural resources in the vicinity of Altus AFB was obtained from several sources, including the Oklahoma Historical Society, the Oklahoma SHPO, the Oklahoma Archeological Survey (OAS), and the National Park Service. A cultural resource assessment conducted by the National Park Service on the base in 1995 found that 38 buildings and structures date to World War II, the Korean Conflict, and the beginning of the Cold War, all meeting the criteria for consideration on the NRHP. These structures must be identified prior to renovation or demolition, and if determined to be potentially eligible, then an eligibility determination and possible Section 106 consultation would be conducted with the SHPO. No structures in the areas adjacent to the base are listed in the SHPO’s national register handbook (USAF 2002a).

Numerous archeological surveys have been completed for Altus AFB, but no intact prehistoric or historic archeological sites have been found in the Altus AFB region. According to the 1995 cultural resource assessment carried out by the National Park Service at Altus AFB, the potential of there being intact archeological resources within the base boundaries and on adjoining properties is extremely low (USAF 2002a).

During a previous environmental impact analysis (*Environmental Assessment for Slow Routes and Instrument Routes, Altus Air Force Base*, February 1996), NRHP-eligible sites were identified within the vicinity of the existing MTRs. Additionally, in all areas crossed by the existing and proposed MTRs, there are archeological and historical resources that

are known to exist but are not considered NRHP-eligible. The potential also exists for there to be unknown archeological and historical resources in the unsurveyed areas. Some of these unknown resources may be NHRP eligible or significant as state resources.

3.1.9 Infrastructure and Utilities

3.1.9.1 Stormwater Drainage

The stormwater collection system at Altus AFB was originally designed to accommodate on-base stormwater flows and projected increased flows associated with future base expansion. However, increased storm flow from the impervious surfaces of off-base housing developments to the northeast caused flooding problems in certain areas of the base. Floodways that discharge into Stinking Creek were installed in susceptible flood-prone areas. The base also experiences flooding during significant rains at the main gate and in the family camping and recreation areas. The problem occurs where Stinking Creek exits the base property and the creek channel narrows. This bottleneck, coupled with the work of beavers, causes water to back up onto base property and flood these low-lying areas. A joint effort by Altus AFB, Jackson County, and the city of Altus is underway to construct retention/detention basins to help alleviate the drainage problems. Construction activities related to new roads near the base recreation areas also have incorporated drainage improvements along the creek (USAF 2002a).

A site inspection conducted in 2002 showed existing floodways throughout the base to be in good condition, although some drainage problems persist in lower-lying areas on base. Stormwater drainage pipes ranging in size from 12 to 66 inches in diameter have been installed throughout the base to quickly drain excessive volumes of stormwater. All water collected in the stormwater collection system drains off to the south, where the water enters Stinking Creek, or to the east via an irrigation canal. A Stormwater Pollution Prevention Plan, with measures such as minibooms, oil-water separators, and operable outfall gates, is in place to recover any pollutants entering the system. In general, responsible adherence to stormwater management and pollution reduction plans is simply considered “good housekeeping” for the base. Approximately 740 acres of impervious cover are located at Altus AFB (USAF 2002a).

3.1.9.2 Solid Waste Management

Municipal solid waste management and compliance at Air Force installations are established in AFI 32-7042, Solid and Hazardous Waste Compliance. AFI 32-7042 incorporates by reference the requirements of RCRA Subtitle D, 40 CFR 240 through 244, 257, and 258, and all other applicable federal regulations, AFIs, and DoD directives. In general, AFI 32-7042 establishes the requirement for installations to have a solid waste management program that incorporates the following: a solid waste management plan; procedures for handling, storage, collection, and disposal of solid waste; record keeping and reporting; and recycling of solid waste, as addressed in AFI 32-7080, Pollution Prevention Program. All municipal solid waste generated at Altus AFB is managed by Air Force contractors and subsequently disposed of at the city of Altus landfill.

All municipal solid waste generated at Altus AFB is managed by Air Force contractors and subsequently disposed of at the City of Altus Landfill which operates a 470-acre disposal facility. The City of Altus Landfill opened in 1983 and operates under ODEQ Permit Number 3533005. The landfill is scheduled for closure in 2015 and receives an average of approximately 120 tons of solid waste per day, or about 43,800 tpy. The total capacity of the landfill is approximately 2 million tons (USAF 2002a).

3.1.9.3 Transportation

Some access streets near the base become congested, particularly in areas with heavy concentrations of office and workspace. During peak traffic times, access to Altus AFB is influenced by heavy traffic, particularly at the main gate. The main gate is open 24 hours a day, 7 days a week. The south gate is open only on workdays from 6:00 a.m. to 5:00 p.m. The street system handles the traffic well during non-peak times. No scheduled on-base shuttle bus service is available for transporting personnel around the base (USAF 2002a).

Vehicle occupancy information obtained from the 97th Security Police Squadron showed that the 1996 average vehicle occupancy rate for Altus AFB was approximately 1.3 persons per vehicle. Approximately 6,540 vehicles per day passed through base gates on workdays. Average daily vehicle traffic each workday at the main gate was about 6,002 vehicles. Approximately 1,100 vehicles used the main gate between 7:00 and 8:00 a.m., with an equal amount between 4:00 and 5:00 p.m. At midday, traffic at the main gate averaged 600 to 800 vehicles per hour. About 538 vehicles passed through the south gate each workday (USAF 2002a).

3.1.9.4 Electricity and Natural Gas

Electrical power is supplied to Altus AFB by Western Farmers Electric Cooperative. The substation that serves the base has a capacity of 25,000 kiloVolt-amperes (kVA). This substation was upgraded in March 2001 and has one, 3-phase transformer rated 15/20/25,000 kVA. In FY 03, Altus AFB used 73,742,480 kiloWatt-hours (kWH) of electricity. This equates to an average of 202,034 kWH per day (Bellon 2004)

Natural gas is supplied to Altus AFB by CenterPoint Energy. The design capacity of the natural gas supply system is 134 thousand cubic feet per hour. Annual usage for FY 03 was 232,033 thousand cubic feet, an average of 636 thousand cubic feet per day (Bellon 2004).

3.1.9.5 Sanitary Sewer

Wastewater from Altus AFB is treated at the City of Altus owned and operated Southeast Wastewater Treatment Plant (WWTP) located just south of Altus AFB near Stinking Creek. Primary treatment processes include aerobic aeration and clarification of the wastewater. The clarifier effluent is discharged directly into Stinking Creek without disinfection. The flow of Stinking Creek intersects with the North Fork Red River which flows into the Red River. The North Fork Red River is fed from the outflows of both the Tom Steed Reservoir and Lake Altus (USAF 2002a).

The Southeast WWTP was designed to process a nominal throughput of 2.3 million gallons per day (mgd) with current average daily flows ranging from 1.2 to 2.3 mgd. An addition of one aeration basin and the modification and rehabilitation of the two existing clarifiers has increased the safe peak hydraulic capacity to 4.0 mgd. Excess flow is diverted to a holding pond to avoid overloading the plant when the influent flow rate exceeds the hydraulic capacity (USAF 2002a).

The Altus AFB wastewater collection system has a line capacity of approximately 250,000 gallons with a design capacity of approximately 3.0 mgd. The system has an average demand of 0.75 mgd, and a historical peak demand of 1.3 mgd which occurred in June 1991. The collection system is adequate, although many sections of the wastewater collection system are quite old and in need of replacement. Infiltration is also a common problem, and the base is currently replacing many of the aging and deteriorating wastewater collection mains. East of the flightline, the collection system service area is limited. Seven septic tank systems have been installed in this limited service area, ranging in size from 500 to 3,000 gallons (USAF 2002a).

3.1.9.6 Potable Water

Altus AFB's sole source of potable water is from the City of Altus municipal water supply. The municipal water system obtains raw water from Lake Tom Steed and supplies the city and surrounding communities with treated potable water from the main water treatment plant. The City of Altus water treatment plant has a maximum treatment capacity of 12.0 mgd and an average daily demand of 5.8 mgd. The water distribution system at Altus AFB is adequate, although many water main sections are quite old and in need of replacement. The water main distribution network is presently a mix of transite, cast iron, and plastic pipes. The oldest pipes were installed during World War II, when the base first became operational. The base is currently replacing some aging and deteriorating water mains. Much of the water mains in the Bicentennial Housing Area have already been replaced with 6-, 8-, and 10-inch plastic pipes (USAF 2002a).

The Altus AFB water distribution system has a line capacity of approximately 250,000 gallons and a design capacity of approximately 3.0 mgd. The system has an average demand of 0.98 mgd, and a historical peak demand of 1.95 mgd. The distribution system maintains an average system pressure of about 58 pounds per square inch. Water is supplied to the base from the City of Altus through two large water mains which enter the base near the main gate. The City of Altus maintains the delivery water mains up to the abandoned base water treatment plant located in Building 309. Currently, the only function of the base water treatment plant is to meter the water (USAF 2002a).

Altus AFB has a total of five elevated water storage tanks, two potable and three nonpotable. The two potable water storage tanks have a water storage capacity of 500,000 gallons and 250,000 gallons with overflow elevations of 136 feet and 132 feet, respectively. Currently, both elevated potable water storage tanks are off-line because the water pressure provided by the City of Altus is greater than the water pressure obtainable from the two elevated storage tanks. The three nonpotable water storage tanks are used

specifically for fire protection. A 500,000 gallon tank is utilized for protection of the maintenance hangers. A 300,000 gallon and a 150,000 gallon tank provide protection of Buildings 424, 435, 509, and 518, and two corrosion control hangers, currently under construction (USAF 2002a).

3.1.10 Socioeconomics

3.1.10.1 Population

Since 1990, Jackson County has experienced a steady decline in the population of the area. According to the USCB, Jackson County's population was 28,764 in 1990 and 28,439 in 2000. The estimated population of the county in 2001 was 27,661. Thus, the county experienced a 1.1 percent decline between 1990 and 2002, and a 2.7 percent decline between 2000 and 2001 (USCB 2003).

Approximately 21,447 people or 75 percent of population of Jackson County resided in the city of Altus in 2000. The city of Altus experienced a 2.1 percent decline in population from 1990 to 2000. Over this time period, the population of Altus declined from 21,910 to 21,447 (ACOC 2003). The population growth for the state of Oklahoma between 1990 and 2000 was approximately 9.7 percent, compared with the nationwide population growth of 13.1 percent for the same period (USCB 2003).

3.1.10.2 Housing

The 1990 census reported a total of 12,125 housing units in Jackson County, with an occupancy rate of 86.2 percent. Thus, there were an estimated 1,670 vacant housing units in the county in 1990. From 1990 to 1995, 264 residential building permits were authorized in Jackson County, increasing the total housing inventory to an estimated 12,389 units. The Census Bureau reported that 95 residential building permits were issued in the city of Altus between 1995 and 1999, increasing the 1999 inventory to 12,484 units (USAF 2002a). The 2000 census reported a total of 12,377 housing units in Jackson County (USCB 2003).

In 1990, single-family detached units accounted for over 85 percent of the total housing units within the county, while mobile homes accounted for about 9 percent. Thus, apartment units accounted for approximately 6 percent of total housing units (USCB 1990).

Based on the above information, there are approximately 12,484 housing units in the city of Altus and Jackson County. Approximately 10,612 are single-family detached units, 1,122 are mobile homes, and 750 are apartment units. Approximately 1,720 housing units (13.8 percent) are estimated to be vacant.

The median monthly rent for renter-occupied housing in Jackson County was $357 in 1990 (USCB, 1990). In 1999-2000, rent for a two-bedroom apartment in the city of Altus ranged between $350 and $550 per month, with a median rent of $450 per month. Rent for a three-bedroom unit ranged from $375 to $690 per month, with a median rent of $570 per

month. Most three-bedroom and larger rental units in the city of Altus are houses or other single-family dwellings (USAF 2002a).

In 1990, the median value for owner-occupied housing units in Jackson County was $42,700. Approximately 60 percent of all owner-occupied homes were valued below $50,000, while 38 percent of owner-occupied homes were valued between $50,000 and $125,000. Less than 3 percent of all owner-occupied housing units were valued above $125,000 (USCB 1990).

The 1999-2000 estimated average sales price for single-family homes in the Jackson County area, including the city of Altus, was $70,922. However, the sales price only represents sales listed in the Multiple Listing Service for Jackson County and may not include all home sales in the area. The 2000 census reported the average value of owner-occupied housing units at $59,600 (USCB 2003).

3.1.10.3 Education

There are six school systems in Jackson County: Altus School District, Navajo School District, Blair School, Duke School, Eldorado School, and Olustee School. The total May 2000 enrollment in Jackson County schools was approximately 5,940 students. Nearly 76 percent of all students in Jackson County primary and secondary schools attend school in the Altus School District.

The Altus School District has six elementary schools, one middle school, one junior high school, and one senior high school. Children of military personnel residing on Altus AFB attend primary and secondary schools in the Altus School District. One of the elementary schools, L. Mendel River School, with classes for grades K-5, is located on Altus AFB. The student enrollment in Altus public schools in May 2000 was 4,502 (USAF 2002a).

The Navajo School District had a peak enrollment of 611 students during the 1997-98 school term. Approximately 35 percent of the Navajo School District's May 2000 enrollment of 526 students were dependents of Altus AFB military and civilian personnel. The Navajo School District has one elementary school, one junior high school, and one high school. The district consists of 146.5 square miles and borders the eastern edge of the Altus School District (USAF 2002a).

An average of 5 to 20 percent of the students enrolled in the Blair, Duke, Eldorado, and Olustee schools are dependents of Altus AFB military and civilian personnel.

Higher education opportunities are offered to residents of Jackson County at Western Oklahoma State College, a 2-year college located in the city of Altus. The Air Force's voluntary education service, directed and managed by the Education Services Flight, offers on-base college and university programs that meet the needs of Altus AFB personnel. The Billman Education Center at Altus AFB offers a variety of courses at the undergraduate and graduate levels. Colleges offering courses of study include Western Oklahoma State College, University of Southern Colorado, Southern Illinois University,

Cameron University, Webster University, and Embry Riddle Aeronautical University (USAF 2002a).

3.1.10.4 Economy

Altus AFB generates economic activity within Jackson County through employee payrolls, local procurements, and other expenditures. The surrounding communities and Altus AFB depend on one another for employment, goods, and services.

Altus AFB supports approximately 2,000 permanent military personnel and approximately 540 students in training per month. About 1,200 military personnel and their families live on base and another 750 live off base. Although the number of military personnel has decreased over the past several years, employment in the nonappropriated fund and contract civilian categories has increased to offset the loss of military personnel (USAF 2002a).

In FY99, the Altus AFB payroll expenditures totaled more than $140 million. Table 3-11 details gross payroll expenditures during FY99. The total economic contribution of Altus AFB to the Jackson County area was estimated to be $201.8 million in FY99 (USAF 2002a).

Table 3-11 Gross Payroll, Fiscal Year 1999, Altus Air Force Base

Category	Expenditures
Appropriated fund military (military permanent party)	$64,444,691
Appropriated fund civilian	42,913,445
Contract civilians	12,550,000
Other civilians	850,289
Military retirees (Air Force, Army, Marines, Navy, Coast Guard)	20,040,000
Total Payroll	**$140,798,425**

Source: USAF 2002a

As reported in the 1999 Altus AFB Economic Impact Report, the Air Force manages more than $453.3 million in capital assets at Altus AFB. The base-controlled resources were valued at nearly $4.6 billion at the end of FY99. In addition, Altus AFB construction projects and other contracts for services, materials, and equipment for FY99 totaled $38.3 million (USAF 2002a).

Altus AFB provides direct employment for approximately 2,400 area residents. An estimated 1,700 area jobs are indirectly supported by the operations of the base. Approximately 98 percent of base employees reside within Jackson County. Altus AFB directly employs nearly 23 percent of the Jackson County workforce, and nearly 16 percent of the county civilian workforce (USAF 2002a).

3.1.11 Airspace

Airspace is a finite resource defined vertically, horizontally, and temporally. As such, it must be managed and used in a manner that best serves the competing needs of commercial, general, and military aviation interests. The FAA is responsible for the overall management of airspace and has established different airspace designations to protect aircraft while operating to or from an airport, transiting between airports, or operating within "special use" areas identified for defense-related purposes. Rules of flight and air traffic control procedures are published as federal aviation regulations, which are established to govern how aircraft operate within each type of designated airspace. The regulations apply to both civil and military airfield operations. However, some regulations exempt military operations, and other regulations specifically exclude military activity. All aircraft operate under either IFR or VFR.

The airspace ROI for Altus AFB includes the airspace within an approximate 29-mile radius (25 nautical miles) from the center of the airfield and up to 9,000 feet above mean sea level. The Altus AFB RAPCON provides advisory services to aircraft operating in this airspace. The airspace controlled by the Altus AFB air traffic control tower is within an approximate 6-mile radius (5 nautical miles) of the airfield and up to an altitude of 3,900 feet. All aircraft operating within this airspace require radio contact with the air traffic control tower, which operates from 7:30 a.m. to 2:30 a.m., 5 days per week (excluding holidays). Occasionally the control tower is open on weekends, when required by the flying training schedule (USAF 2002a).

3.2 AFFECTED ENVIRONMENT FOR SOONER DROP ZONE VICINITY

3.2.1 Installation Location, History, and Current Mission

In October 1994, the Air Force acquired a 640-acre (1 square mile) tract of land (designated as the Sooner DZ) located about 23 miles southwest of Altus AFB. Airdrop training occurs at the Sooner DZ, within an area measuring 1,760 yards (1 mile) long by 1,600 yards wide (80-yard buffer zone on either side). Activities on site support Altus AFBs overall mission to operate the only strategic airlift, aerial delivery, and air refueling training in the Air Force. These activities support training of DoD personnel and the personnel of various United States allies.

3.2.2 Noise

DZs are areas designated for the aerial delivery of cargo or personnel. Under current conditions, aircrew from Altus AFB use the Sooner DZ. The Sooner DZ and surrounding properties is located in a rural area of southwestern Oklahoma. The land is characterized as broad areas of cropland and rangeland with the small communities of Gould (population 237) about six miles to the northwest and Eldorado (population 573) approximately six miles to the southeast. There are no other potential sensitive receptors such as national parks, recreational areas, wildlife areas, hospitals, schools, or Indian Reservations in the vicinity of Sooner DZ.

Approximately two-thirds of the land in the vicinity of Sooner DZ is cultivated each year. Noise from a tractor ranges between 80 and 90 dBA at 50 feet (CERL 1978). Baseline noise levels for the establishment of the Sooner DZ were assessed (USAF 1993a) using the Air Force-approved Model for Predicting Noise Exposure from Aircraft Operations on MTRs, also known as ROUTEMAP. ROUTEMAP is a "line" model developed by the Air Force that calculates noise contours parallel to the MTR centerline. The noise metric is computed as an Onset-Rate Adjusted Monthly Day-Night Average Sound Level (L_{dnmr}). The model utilizes input data such as aircraft type, number of day and night operations during a month, and nominal values for aircraft airspeed, engine power setting, and altitude. Noise levels calculated by ROUTEMAP were not found to be excessive (USAF 1993a). An alternative method to better represent noise resulting from actual drop zone flight patterns is to create a “runway” along the track flown during air drops, and use the Air Force computer programs for predicting noise around airfields. These are the programs BASEOPS (Lee and Mohlman 1990) and NOISEMAP (Moulton 1990). Under current conditions, about 18.9 daily aviation operations are conducted at the Sooner DZ (See Table 3-12). Baseline noise levels at the Sooner DZ are depicted on Figure 3-4. The 65 L_{dn} contour shown encompasses approximately 233 acres. No population is exposed to elevated noise levels.

Table 3-12 Average Daily Operations, Sooner Drop Zone Vicinity, 2002

	Arrivals		Departures		Closed Patterns	
Aircraft	Day	Night	Day	Night	Day	Night
C-17	0.0	0.0	0.0	0.0	5.9	3.5
Total	**0.0**	**0.0**	**0.0**	**0.0**	**5.9**	**3.5**

Note: Daily operations are based on averages of annual operations; therefore, numbers do not round.
Source: AETC 2002

3.2.3 Air Quality

The ROI for Sooner DZ includes the area around the proposed ALZ near the Sooner DZ in Harmon County.

3.2.3.1 Meteorology

Given the close proximity of the two areas, the meteorological conditions in the vicinity of Sooner DZ are similar to those defined for Altus AFB. As a result the conditions discussed in Section 3.1.3.1 of this document would also apply to the Sooner DZ.

3.2.3.2 Air Pollutants and Regulations

The same air pollutants and regulations discussed in Section 3.1.3.2 would apply to the ROI for Sooner DZ. The nearest PSD Class I area to Sooner DZ is the Wichita Mountains Wilderness, which is located approximately 50 miles east of the proposed site.

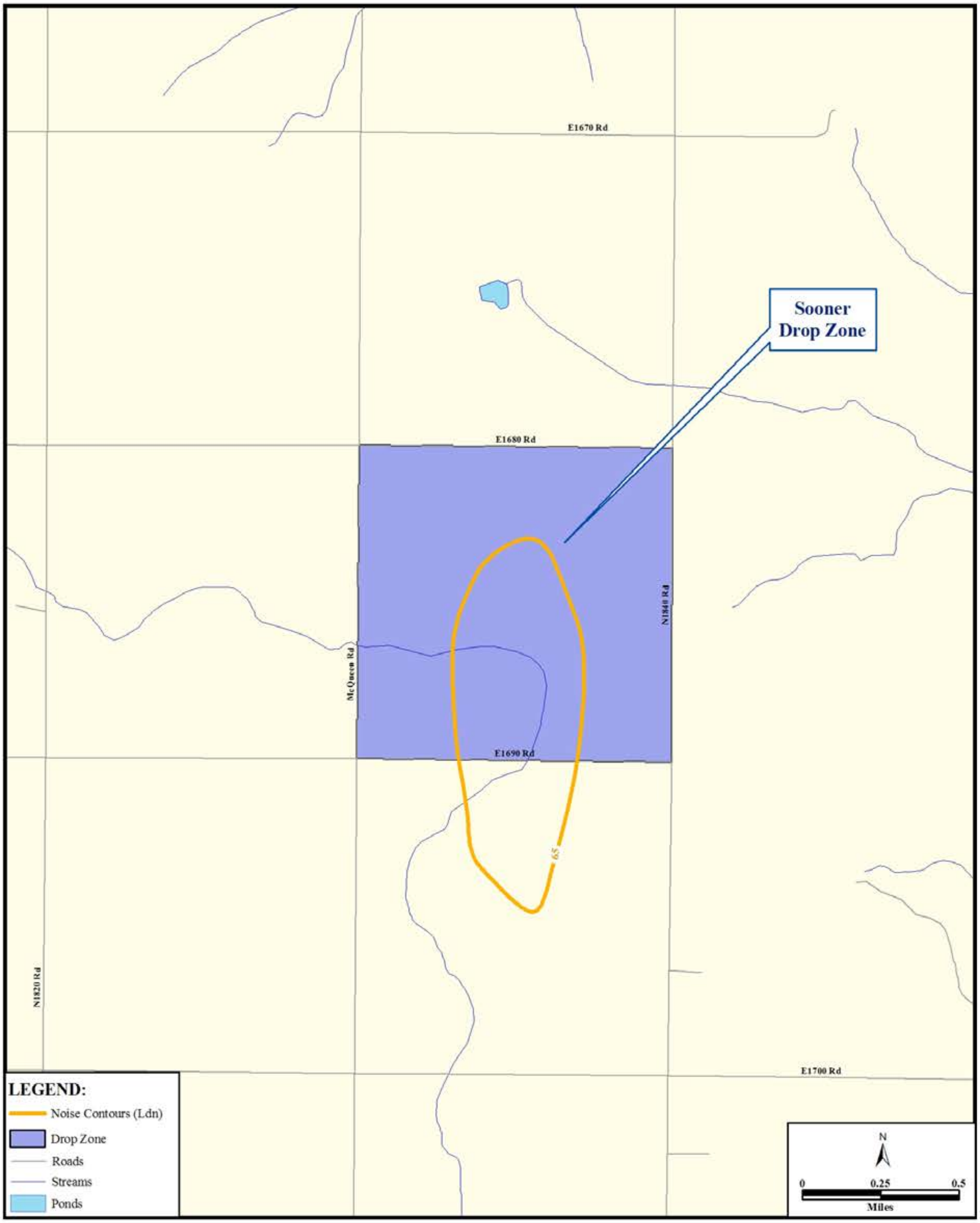


Figure 3-4 Baseline Noise Levels, Sooner Drop Zone

3.2.3.3 Regional Air Quality

Sooner DZ is located within the southwestern Oklahoma Intrastate AQCR 189. The regional air quality conditions discussed in Section 3.1.3.3 for Altus AFB would apply to the ROI associated with the Sooner DZ.

An accurate regional emissions inventory is needed to assess the potential contribution of a source or group of sources to regional air quality. An emissions inventory is an estimate of total mass emissions of pollutants generated from a source or sources over a period, typically one year. Current baseline emissions from aircraft operations at the proposed sites are presented in the sections below.

3.2.4 Earth Resources

3.2.4.1 Geology

The surface and near-surface geology of Harmon County consists of Permian and Quaternary sediments and rocks. During the Permian Period, southwestern Oklahoma was on the eastern side of an inland sea. A thick layer of red shales and saline-sea evaporites (gypsum and salt) were deposited here. Sediment layers in the county include, from oldest to youngest, the Flowerpot Shale, the Blaine Formation, Dog Creek Shale, the Whitehorse Group, and Quaternary terrace and alluvial deposits (USAF 2003a).

Of most interest, the Blaine Formation is comprised of nine gypsum beds separated by layers of red shale and gray dolomite. This formation is about 200 feet thick in Harmon County and is encountered at depths of 50 to 100 feet southeast of Hollis. It outcrops (rocks are exposed at the surface) in the northern, south-central, and extreme southeastern parts of the county. Within the Blaine Formation, gypsum is common at depths of less than 100 feet, whereas anydrite is found greater than 100 feet deep (USAF 2003a).

Gypsum is mined from some areas of this formation, especially in western Jackson County near Duke. Many areas of the Blaine Formation have been weathered away, chemically changing the gypsum to calcium and sulfate in solution, and water. The dolomite tends to be thicker than the gypsum in Harmon County. Currently, because of the depth at which the gypsum lies, it is not economical to mine gypsum in southeastern Harmon County (USAF 2003a).

Gypsum and dolomite beds of the Blaine Formation have been partly dissolved by circulating groundwater and contain extensive caves, sinkholes, disappearing streams, springs, and underground rivers. These beds make up a major aquifer which provides irrigation water for much of the Hollis Basin (USAF 2003a).

The Dog Creek Shale overlies the Blaine Formation and commonly outcrops in Harmon County. The Dog Creek Shale is comprised of red-brown shale with beds of gypsum and dolomite in the bottom 50 feet of the formation. The total thickness of the formation varies from 50 to 200 feet thick. The Dog Creek Shale lies at a depth of 12 to

80 inches below the surface of the Sooner DZ. The Whitehorse Group, an orange-brown to red-brown sand and sandstone, is discontinuous throughout the county because of erosion. This group is not present at or near the Sooner DZ (USAF 2003a).

Quaternary sediments, consisting of sand, gravel, and clay are generally 10 to 100 feet thick. These sediments were deposited as rivers and streams changed courses or flooded and contributed to the development of soils in or near drainages, including those in the Sooner DZ. Only minor amounts (less than six feet) of Quaternary terrace deposits are found within the drainages of the Sooner DZ (USAF 2003a).

3.2.4.2 Topography

Harmon County consists of low hills and plains of the Hollis Basin in Interior Plains physiographic province. The relief in Harmon County is dominated by nearly level to gently sloping uplands. Elevations within the vicinity of Sooner DZ range from 1,496 feet msl at the southern edge to 1,530 feet msl in the northern and eastern portions. All but the southwest quarter slopes gently toward the center of the section. This quarter section is comprised of a small hill that slopes in all directions (USAF 2003a).

3.2.4.3 Soils

The soils of Harmon County are derived from the weathering (breakdown by physical and/or chemical processes) of sandstone, clay, shale, gypsum, and limestone. The soils in the vicinity of the proposed ALZ expansion area formed in clay sediments and shale. The hydric soils (i.e., soils formed under conditions of saturation) series in the proposed expansion area are described in Table 3-13. Hydric soils, a criteria associated with wetlands, are saturated, flooded, or ponded for a significant period of the year restricting their use for construction. The soils identified in Table 3-13 have been designated by the NRCS as prime farmland (USDA 1984).

Table 3-13 Prime Farmlands, Proposed Assault Landing Zone Area, Sooner Drop Zone Vicinity

Soil Series	Description	Map Legend[1]	Hydrologic group[2]	Acreage	
				Site No. 1	Site No. 2
Aspermont	Silt loam, 1 to 3 percent slopes	7	C	0	4.4
Hollister	Silty clay loam, 0 to 1 percent slopes	31	D	32.6	14.2
Tillman	Clay loam, 0 to 1 percent slopes	55	C	163.8	185.2
Tillman	Clay loam, 1 to 3 percent slopes	56	C	376.0	333.3

[1] See Figure 3-5

[2] A - high infiltration, low runoff
B - moderate infiltration, moderate runoff
C - slow infiltration, moderate to high runoff
D - very slow infiltration, high runoff

Note: "-" indicates the soil is not present at the location

Source: USDA 1984

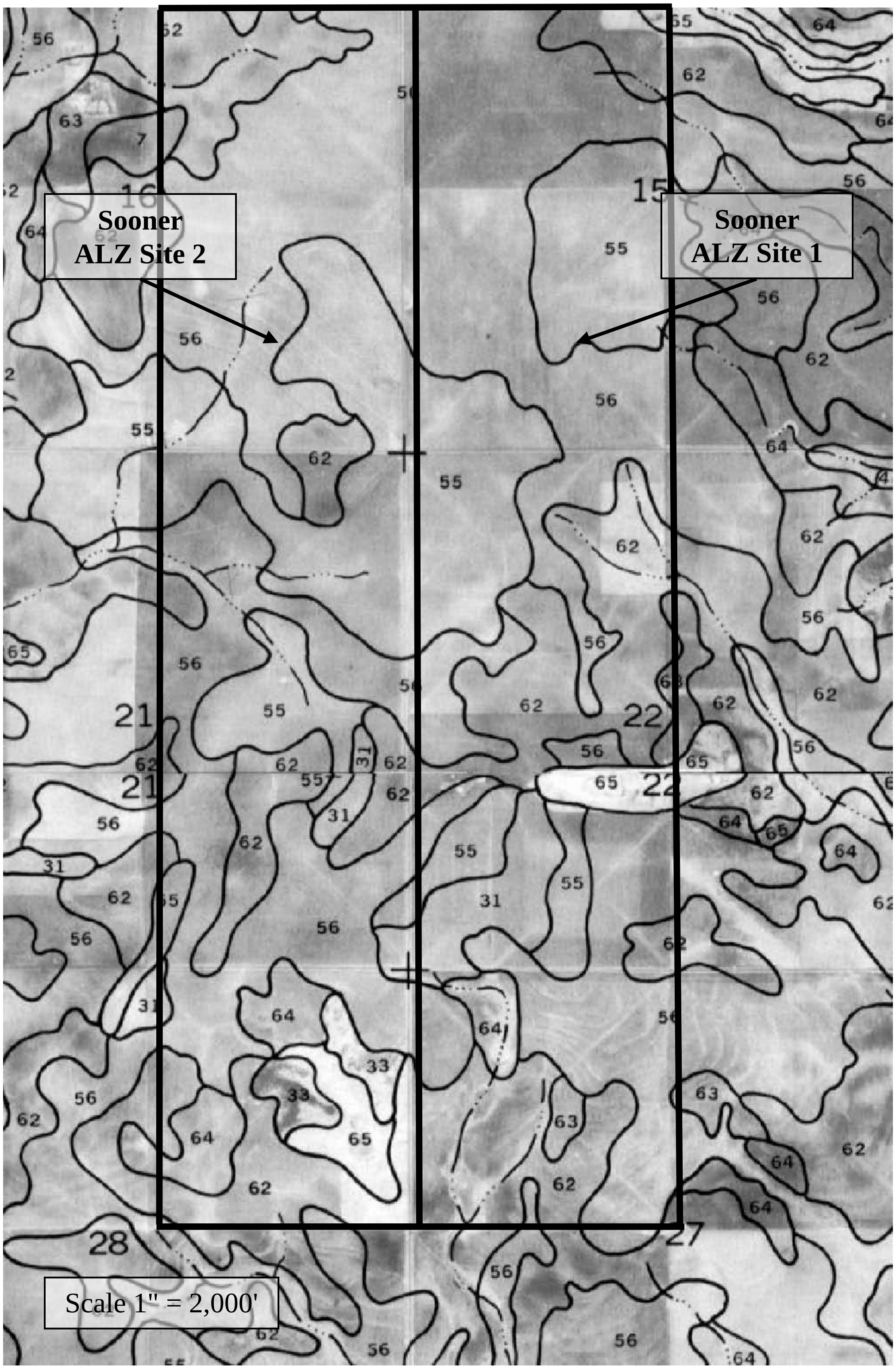


Figure 3-5 Soil Types, Sooner Drop Zone

Most of the soils are classified as clay loam and some as silty clay with depths to 80 inches. Permeabilities are generally very slow to slow, and runoff is generally moderate to high; brief flooding occasionally occurs on the soils located in drainages. The risk of soil erosion is generally moderate to high.

Lands identified with soils that are prime and unique or soils of statewide and local importance are subject to the provisions of the Farmland Protection Policy Act of 1981 (FPPA). The purpose of the FPPA is to minimize the extent to which federal programs contribute to the unnecessary and irreversible conversion of farmland to non-agricultural uses. In addition, the act assures that federal programs are administered in a manner that, to the extent practicable, will be compatible with state and local government and private programs to protect farmland.

3.2.5 Water Resources

3.2.5.1 Surface Water

The proposed ALZ options at the Sooner DZ are located in the Sandy Creek watershed which is part of the Red River drainage basin. The Red River forms the border between Oklahoma and Texas. A USGS topographical map for the area indicates an intermittent stream with its upper reaches beginning approximately four miles northwest of the existing Sooner DZ and draining over four miles to the south into the perennial Sandy Creek. Most of this stream has been altered by agriculture and thus, is not apparent on the landscape (USAF 2003a).

Within the proposed expansion area, a dry, unnamed stream meanders through the property, from the north through the western portion of the property and exiting to the south. Sections of the streambed vary in depth from 2 to 5 feet (USAF 2003a).

Although inclusions of hydric soils are located within the proposed expansion area, they do not support the hydrology or vegetation to be classified as wetlands. The section is not located within any floodplain of Sandy Creek, Gypsum Creek, or the Red River.

3.2.5.2 Groundwater

The Sooner DZ lies within the Hollis basin of southwestern Oklahoma and northern Texas. Gypsum and dolomite beds of the Blaine Formation contain extensive caves that have formed a major karst aquifer in the area, with depth to the water table commonly ranging from 5 to 80 feet below the land surface. The Blaine Formation provides irrigation water for much of the Hollis basin; irrigation wells in the area typically are 50 to 300 feet below the surface, yielding 300 to 2,000 gallons per minute. A well drilled in the Sooner DZ (time unknown) hit groundwater in the Blaine Formation at approximately 65 feet below the surface. The water was too saline for livestock consumption and is not used (USAF 2003a).

In the area of Sooner DZ, the Blaine Formation is overlain by the Dog Creek Shale. Where the Dog Creek Shale is over 100 feet thick, it acts as a confining layer. However,

when the Dog Creek Shale is less than 100 feet thick, as it is within the vicinity of the Sooner DZ, karst features cause it to act as a leaky confining layer that could allow contaminants into the Blaine Aquifer (USAF 2003a).

Regional groundwater flow in the area is from the northwest to the southeast. Sandy and Turkey Creeks recharge the Blaine Aquifer during periods of stormwater runoff when the stream stage is higher than normal, and receive discharge from the Blaine aquifer during most of the rest of the year. Precipitation on outcrop areas of the Blaine Formation provide additional recharge. The Blaine Aquifer is highly utilized in the region for irrigation; the water is being used faster than the natural recharge rate. The Blaine Aquifer is artificially recharged to maintain the water level for irrigation purposes, primarily by diverting surface water to sinkholes, caves, and other natural openings in karst areas (USAF 2003a).

3.2.6 Hazardous Materials and Wastes

3.2.6.1 Hazardous Materials

Hazardous materials procured for, stored, and used at the Sooner DZ would be managed in accordance with AFI 32-7080, *Pollution Prevention Program*, as discussed in Section 3.1.6.1.

3.2.6.2 Hazardous Waste

All hazardous waste generated at the Sooner DZ would be managed in accordance with all of the state and federal regulations discussed in Section 3.1.6.2. However, currently there are no hazardous wastes generated at Sooner DZ as a result of existing Air Force operations.

3.2.6.3 Installation Restoration Program

There are no IRP sites located in the vicinity of Sooner DZ.

3.2.6.4 Lead-based Paint and Asbestos

Lead-based paint and asbestos management, abatement, and disposal on Sooner DZ would comply with the regulations and requirements discussed in Section 3.1.6.4 of this document.

3.2.7 Biological Resources

3.2.7.1 Vegetation

The southwest corner of Oklahoma lies in the transition zone between the mixed grass prairie and short grass prairie. Warm season grasses dominate this area and species common to both regions are found within the area. Most of the grassland found on more productive soils has been converted to crop and pasture lands. Marginal or low quality soils have been left or allowed to revert to rangeland, primarily mesquite

(*Prosopis juliflora*). Woodlands are very limited, existing mainly as tree-row windbreaks and along waterways (USAF 1993a).

The majority of the area within the vicinity of the Sooner DZ is planted in winter wheat on a yearly non-rotational basis. Annual and perennial weeds including curly dock *(Rumex crispus)* and ragweed *(Ambrosia artemisiifolia)* are found in the cropped area and along the degraded areas of the waterways. Weed control on the wheat crop is accomplished with herbicides such as Ally®, Glean®, and 2,4-D (USAF 1993a).

Another type of vegetative cover located in the vicinity of the Sooner DZ is mesquite shrubland. This less productive land has been used for grazing in the past. This area is dominated by mesquite shrub with an understory of wheatgrasses *(Agropyron albicans)*, grama grasses *(Gramineae Bouteloua)*, prickly pear cactus *(Opuntia lasiacanta)*, yucca *(Yucca glauca)*, sunflowers *(Helianthus)*, and forbs such as globemallow *(Sphaeralcea ambigua)* and vetches *(Leguminosae Vicia)* (USAF 1993a).

3.2.7.2 Wildlife

The area surrounding Sooner DZ consists of transitional vegetation between the grasslands and mesquite rangelands. This provides habitat for a variety of wildlife species. The larger mammals common to the area are white-tailed deer *(Odocoileus virginianus)*, gray fox *(Urocyon cinereoargenteus)*, and coyote *(Canis latrans)*. Other mammals include prairie dogs *(*Cynomys *Ludovicianus*), ground squirrels *(Otospermophilus beecheyi)*, pocket gophers *(Thomomys talpoides)*, skunks *(Mephitis mephitis)*, eastern cottontails *(Sylvilagus floridanus)*, and field mice. Common amphibians and reptiles include the bull frog *(Rana catesbeiana)*, common garter snake *(Thamnophis sirtalis)*, black snake (*Elaphe obsoleta*), and common snapping turtle *(Chelydra serpentina)* (USAF 1993a).

Numerous avian species are known to migrate through and inhabit the floodplains and wetlands associated with the Red River and it tributaries - the Salt Fork and the North Fork. The Red River, forming the border between Oklahoma and Texas, is approximately 10 miles south of the Sooner DZ. During migration, cranes, geese, and ducks utilize important staging areas along the Red River. Species common to the area around Harmon County include red-winged blackbird (*Agelaius phoeniceus*), American egret *(Egretta albus)*, western meadowlark *(Sturnella neglecta)*, mourning dove *(Zenaida macroura)*, eastern screech owl *(Otus asio)*, quail *(Coturnix coturnix)*, and red-tailed hawk *(Buteo jamaicensis)* (USAF 1993a).

As discussed in Section 3.1.7.2 for Altus AFB, bird-aircraft strikes are considered a flight safety issue related to migratory and resident birds. The airspace utilized by aircraft from Altus AFB has been assessed in regard to bird-aircraft strike hazards. The analysis concluded that in relation to bird-strike potential, only moderate to occasional bird activity exists in the vicinity of Sooner DZ (USAF 1993a).

3.2.7.3 Threatened and Endangered Species

The ODWC, OBS, and the USFWS were consulted on the potential for listed threatened and endangered species that occur on or migrate through the Sooner DZ. Although there are no known federal or state listed threatened or endangered species located in the immediate project area, the bald eagle, the interior least tern and the whooping crane have the potential to occur in Harmon County (USAF 1993a). Other species that have the potential to occur in the area are listed in Table 3-14.

Table 3-14 Federal and State Listed Threatened and Endangered Species, Harmon County, Oklahoma

Scientific Name	Common Name	Status	Occurrence
Dipodomys elator	Texas kangaroo rat	C2	4
Phrynosma comutum	Texas horned lizard	C2	4
Faico peregrinus anatum	American peregrine falcon	E, SE	4
Haliaeetus leucocephalus	Bald eagle	E, SE	4
Sterna antillarum athalassos	Interior least tern	E, SE	4
Grus americana	Whooping crane	E, SE	4
Lanius ludovicianus	Loggerhead shrike	C2	4
Plegadis	White faced ibis	C1	4
Faico peregrinus tundrius	Arctic peregrine falcon	T, SE	4

C1 - Category 1 candidate species
C2 - Category 2 candidate species
SE = State Endangered range
ST = State Threatened
E = Endangered
T = Threatened
1 = Known to occur on property
2 = Seasonal occurrence
3 = Occurrence probable
4 = Property is within species range
Source: USAF 1993a

3.2.7.4 Wetlands

No wetlands have been designated in the vicinity of Sooner DZ.

3.2.7.5 Floodplains

Harmon County is not a participant in the NFIP. In participating communities, the extent of SFHAs are determined and published in FIRMs by FEMA. Based on the field survey accomplished during the preparation of this EA, floodplains do not appear to exist in the area.

3.2.8 Cultural Resources

The Sooner DZ is located within Harmon County, which was largely a Comanche Indian hunting area prior to the settlement of ranchers in the mid-1800s. The area was part of the Louisiana Territory purchased by the United States in 1803 and was granted to Oklahoma Territory in 1891. The area is slightly rolling and located approximately 10 miles from the Red River.

The Oklahoma State Historic Preservation Office and the OAS were consulted on the potential for cultural resources within the project area (Appendix A). In February and March 2003, an archeological field investigation was performed in the proposed expansion

area. As a result of the investigation, 12 archeological sites, one group of standing structures, 26 isolated occurrences, and one current cultural manifestation were identified within Sooner ALZ Site 1 during the field investigation. For Sooner ALZ 2, 17 archeological sites, one group of standing structures, 18 isolated occurrences, and five current cultural manifestations were identified. A report detailing the findings is included in Appendix B.

3.2.9 Socioeconomics

3.2.9.1 Population

The population of Harmon County was 3,793 in 1990 and 3,283 in 2000 which reflects a decline of 13.4 percent in the area (USCB 2003). With an area of 538 square miles, the county has a population density of 6.1 persons per square mile. In 1999 Hollis, the county seat, was the largest community with a population of 2,958 (Cook 2002).

3.2.9.2 Housing

The 2000 census indicated that there were 1,647 housing units in Harmon County. The average value of an owner-occupied unit in 2000 was $28,000 with a home-ownership rate of 77 percent (USCB 2003).

3.2.9.3 Education

Harmon County has two school districts. The majority of the county is in the Hollis School District (including the Sooner DZ and vicinity) which levies a tax rate of $44 per $1,000 assessed value (USAF 1993a).

3.2.9.4 Economy

The average household income as identified by the 2000 census for Harmon County is $22,365, with a per capita income of $13,464. Less than 30 percent of the residents of Harmon County live at or below poverty as defined by the US Census Bureau. Retail sales for 1997 for Harmon County were estimated at $20,237,000 resulting in a per capita retail sales of $5,746 (USCB 2003).

3.2.10 Transportation

The principle highway in the vicinity of Sooner DZ and the proposed expansion area is US Highway 62, traveling east to west through the City of Altus to the Oklahoma/Texas border. The primary highways are maintained by the State of Oklahoma and are generally two-lane roadways of concrete and/or asphalt construction. Secondary roads are maintained by Harmon County and are of asphalt (blacktop) or unimproved (graded dirt) construction. The primary roads usually have maintained shoulders and drainage ditches, whereas, secondary roads generally have little if any shoulder area and drainage ditches are not regularly maintained (USAF 2003a).

One route to the proposed expansion area is via US Highway 62, which is four lanes for a distance of approximately seven miles outside Altus, and a blacktop county road that

forms the west section line. The south section line road is also blacktop, but is not in good condition. The north and east section roads are of unimproved construction (dirt and gravel). Access to the expansion area from any other direction requires traveling on unimproved roads. There are no existing roads located within the proposed expansion area (USAF 2003a).

3.3 AFFECTED ENVIRONMENT FOR CLINTON-SHERMAN INDUSTRIAL AIRPARK

3.3.1 Installation Location, History, and Current Mission

CSIA is located in Washita County, next to the City of Burns Flat, Oklahoma, half way between Oklahoma City, Oklahoma and Amarillo, Texas. The airpark currently consists of approximately 2,700 acres of industrial and commercial facilities, with a 13,502-foot runway. CSIA began as a naval air station in 1942, when the DoD purchased approximately 5,000 acres in the remote southwestern region of Oklahoma. The installation was used for pilot training and aircraft storage until 1946, when the DoD closed the station and released the property to the War Assets Administration for disposal. In 1947 the original 5,000 acres were turned over to the City of Clinton, Oklahoma and eventually renamed as the Clinton-Sherman Airport. Then in 1955 the DoD re-acquired 2,700 acres under the ownership of the Air Force and management of the SAC. The base was then renamed to Clinton-Sherman AFB, and became a fighter and satellite bomber base. The base continued until December 31, 1969 went the installation was closed by the DoD. In June 1971 the former base was deeded to the City of Clinton and leased to the Midwestern Oklahoma Development Authority. As private development occurred on the former base, a large portion of the installation was reserved for educational purposes and development. In 1973, the former base was renamed once again to CSIA (Global 2001).

Since July 1993, CSIA has been managed by the Southwestern Oklahoma Development Authority (SWODA) and houses both aviation support activities as well as educational activities (Global 2001). As an educational center in the area, the Western Technology Center served as a draw for both aviation- and non-aviation-related industries such as Flower Aviation, Halliburton, and Janesville (Brown 2003). A site plan depicting CSIA is presented on Figure 3-6.

3.3.2 Noise

3.3.2.1 Aircraft Operations

The airspace RIO for the CSIA includes the airspace within an approximate 5-nautical-mile radius from the center of the airfield and up to 4,500 feet mean sea level. Control tower personnel control this airspace. The tower normally is operational from 8:00 a.m. to 10:00 p.m., Monday through Friday. All aircraft operating within the airspace require radio contact with the Airpark control tower when it is in operation. During periods when the control tower is not operational, the Fort Worth Air Route Traffic Control Center (ARTCC) controls air traffic within the vicinity.

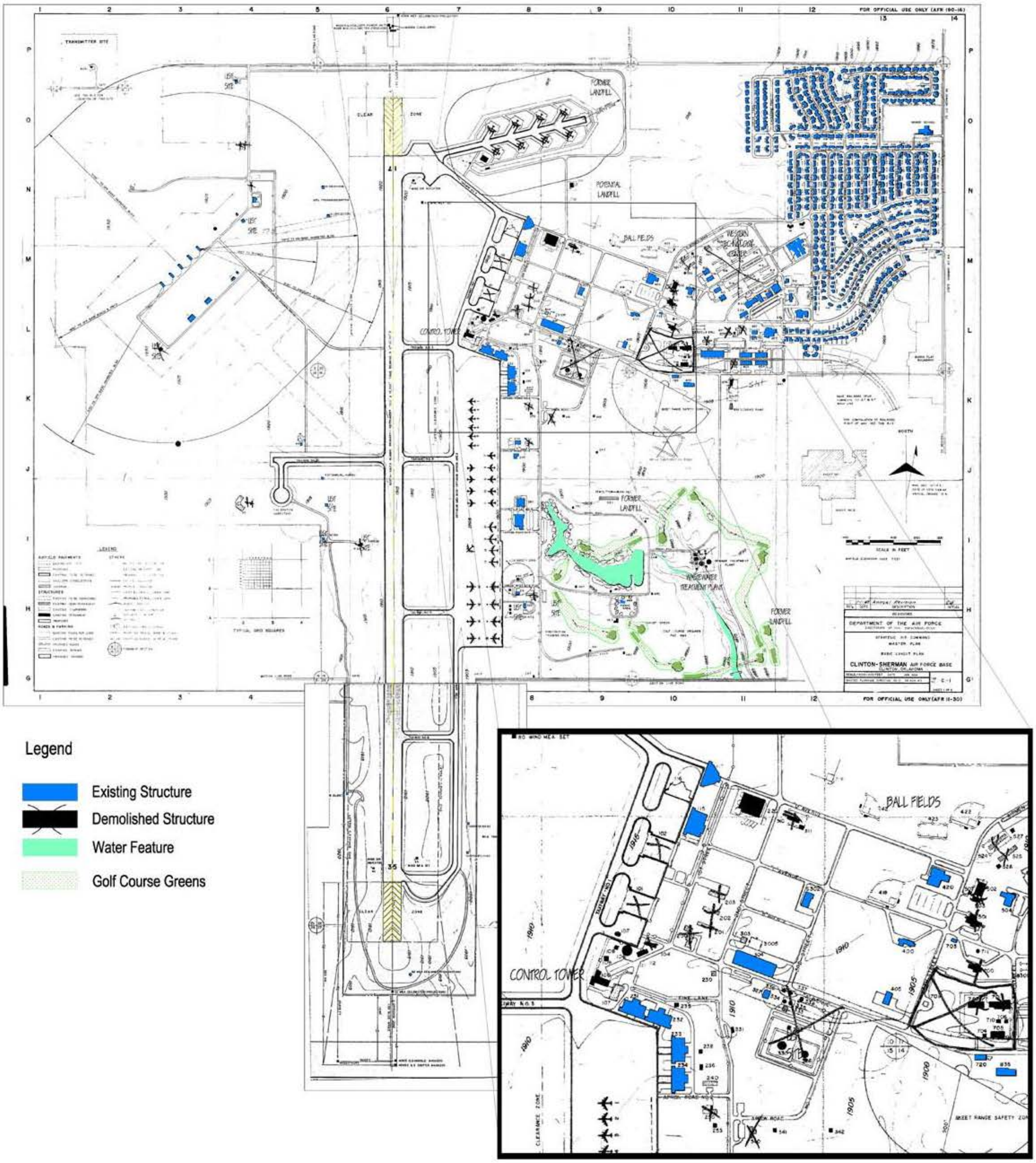


Figure 3-6 Site Plan, Clinton-Sherman Industrial Airpark

The ARTCC provides radar control for aircraft arriving at and departing the Airpark. Unlike the radar services provided by the Altus AFB RAPCON to all aircraft arriving at and departing the base, the ARTCC does not provide radar vectoring for all aircraft accomplishing closed patterns associated with instrument approaches. The primary function of the ARTCC is to provide radar services to en route aircraft, as well as for the initial arrival into the Airpark and the final departure. Thus, radar vectoring is provided to aircraft accomplishing closed patterns associated with instrument approaches only if requested by the aircrew and if the ARTCC controller's workload allows. Aircrews operate in a nonradar environment when ARTCC services are not used for closed patterns associated with instrument approaches. Under nonradar conditions, aircrews operate under VFR, in which the pilots are responsible for aircraft spacing.

There are no public or private-use airfields within the CSIA airspace ROI. Two federal airways pass within 5 miles of CSIA. There are no special-use airspaces or military training routes within the 5-mile radius.

The main runway at CSIA is designated as runway 17R/35L. It is approximately 13,500 feet long and 300 feet wide. A smaller parallel runway (17L/35R) is marked on the parallel taxiway and into the ramp area. It is 5,200 feet long and approximately 75 feet wide. General aviation aircraft use this smaller runway, especially when large aircraft are operating on the main runway. Altus AFB aircraft use the main runway (17R/35L).

CSIA supports both IFR and VFR operations. A mix of military and general aviation activities occurs, with military operations dominating. Altus AFB aircraft and T-1, T-37, and T-38 aircraft from Vance AFB comprise the majority of the airfield operations at the Airpark. Because of differences in aircraft traffic pattern requirements (pattern size and aircraft airspeeds), aircraft from the two bases generally accomplish operations in separate time periods. Vance AFB aircraft use the 8:00 a.m. to 11:00 a.m. period and Altus AFB aircraft operate between 11:00 a.m. and 10:00 p.m. General aviation activities consist of operations by small single-engine and twin-engine aircraft. Altus AFB and Vance AFB, other military, and civil aircraft accomplish approximately 188 daily operations at the airfield under baseline conditions.

Runway 17R/35L is the primary instrument runway. A variety of instrument approaches are published to provide for safe recovery of aircraft during marginal weather conditions or for practicing instrument approach procedures. Aircraft are restricted from overflying the Foss Reservoir, Washita National Wildlife Refuge, Elk City, and the Elk City Airport, all of which are north of the airfield, at altitudes below approximately 2,100 feet AGL.

Military aircraft visual flight patterns are flown to the west of CSIA at altitudes of approximately 1,500 feet AGL. Large aircraft such as the Altus AFB aircraft use 1,000 feet AGL. Trainer aircraft such as the Vance AFB aircraft and fighter aircraft fly patterns at 1,500 feet AGL. General aviation operations remain to the east of the airfield and use runway 17L/35R when military operations occur. Control tower personnel are responsible for aircraft separation within the Airpark control tower airspace

(i.e., approximately five nautical miles from the center of the airfield). Air Force training operations at the Airpark are conducted only when the control tower is operational, 8:00 a.m. through 10:00 p.m.

3.3.2.2 Baseline Noise

Under baseline conditions, CSIA supported approximately 300 daily aviation operations. Average daily operations at the facility are shown in Table 3-15 and areas and population exposed to elevated noise levels are described in Table 3-16.

Table 3-15 Average Daily Operations, Baseline Conditions, Clinton-Sherman Industrial Airpark

Aircraft	Arrivals		Departures		Closed Patterns[1]	
	Day	Night	Day	Night	Day	Night
C-5	1.00	0.00	1.00	0.00	8.50	0.00
C-17	4.00	0.00	4.00	0.00	16.00	0.00
KC-135R	4.36	0.00	4.36	0.00	27.32	0.00
Other Military	29.42	0.00	29.42	0.00	48.05	0.00
Civil	7.00	0.00	7.00	0.00	4.38	0.00
Total	**45.78**	**0.00**	**45.78**	**0.00**	**104.25**	**0.00**

Source: AETC 2003
Note: Daily operations are based on averages of annual operations; therefore, numbers do not round.
1 - Since closed patterns are essentially an arrival and takeoff, the 104.25 closed patterns shown equate to 208.50 aviation operations.

Table 3-16 Land Area Exposed to Indicated Sound Levels, Baseline Conditions, Clinton-Sherman Industrial Airpark

Condition	Day-Night Average Noise Level (L_{dn}dBA)					
	65-70	70-75	75-80	80-85	85+	Total
CSIA						
Acres	3,255.3	1,315.1	589.2	289.3	167.8	**5,616.7**
Population [1]	36	15	3	0	0	**54**
Persons Annoyed [2]	6	4	1	0	0	**11**

Note: [1] Population exposed is estimated based on census tract population data, and the relative proportion of the tract encompassed by given contour levels.
[2] Persons expected to be annoyed is estimated based on total population exposed, and the average percentage of that population expected to be annoyed by the indicated noise level (see Table 3-3).
Source: NOISEMAP; USCB 2002

Noise contours are illustrated in Figure 3-7. The flight tracks of aircraft flown at, and in the immediate vicinity of CSIA, are shown in Figure 3-8.

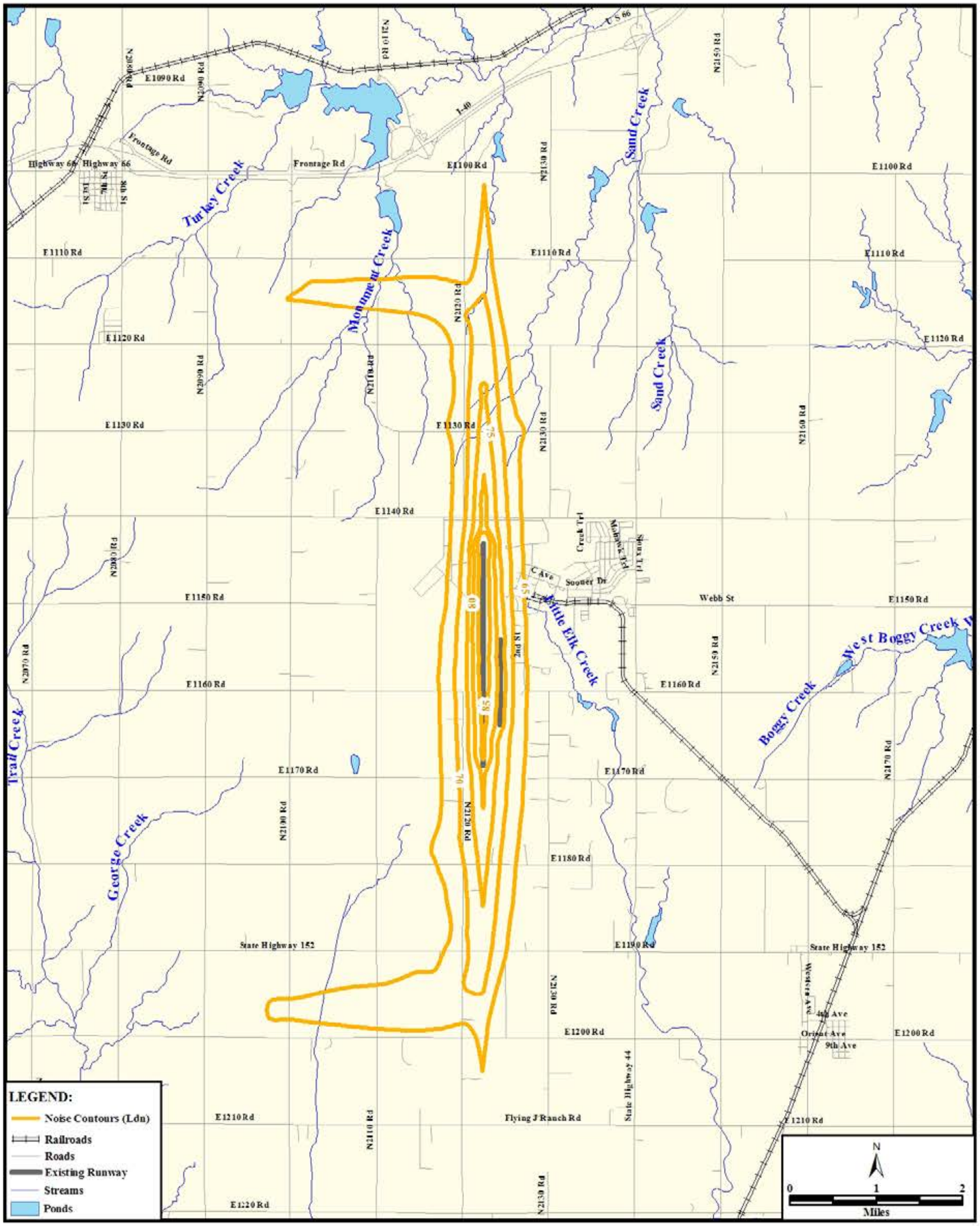


Figure 3-7 Baseline Noise Contours, Clinton-Sherman Industrial Airpark

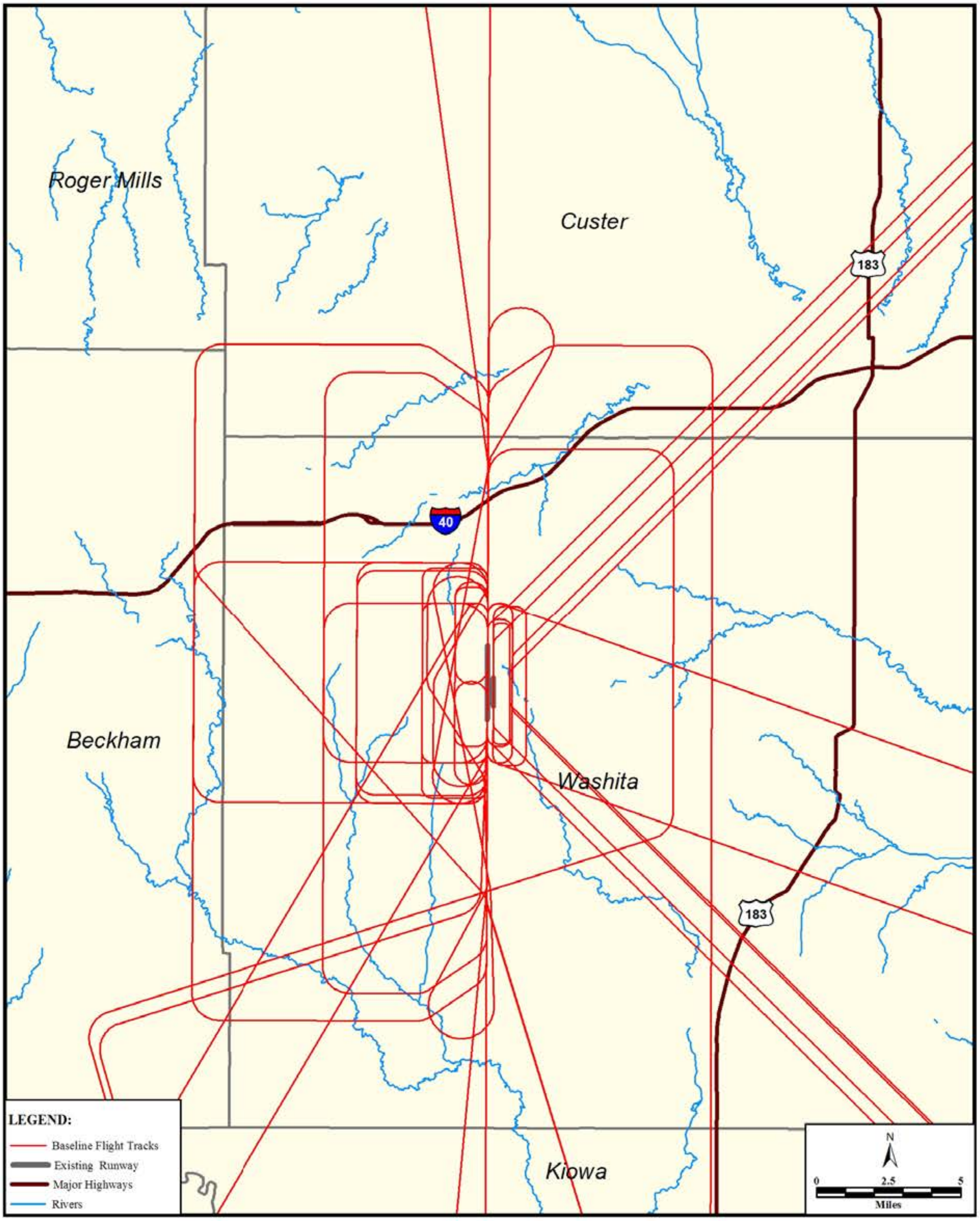


Figure 3-8 Aircraft Flight Tracks, Clinton-Sherman Industrial Airpark

3.3.3 Air Quality

3.3.3.1 Meteorology

Given the close proximity of the two areas, the meteorological conditions in the vicinity of CSIA are similar to those defined for Altus AFB. As a result the conditions discussed in Section 3.1.3.1 of this document would also apply to the CSIA

3.3.3.2 Air Pollutants and Regulations

The same air pollutants and regulations discussed in Section 3.1.3.2 would apply to the ROI for CSIA. The nearest PSD Class I area to the proposed site is the Wichita Mountains Wilderness, which is located approximately 70 miles southeast of CSIA.

3.3.3.3 Regional Air Quality

CSIA is located within the southwestern Oklahoma Intrastate AQCR 189. The air quality in the region is generally good. All 12 counties within AQCR 189 are classified by the EPA as attainment or unclassified for all criteria pollutants (USAF, 1994a). A review of recent (1998 and 1997) air quality data from AQCR 189 showed no exceedances of the air quality standards for the monitored pollutants (CO, NO_2, O_3, and PM_{10}) (USAF 2002a).

3.3.4 Earth Resources

3.3.4.1 Geology

CSIA is located in the Osage Plains section of the Central Lowland province. Rocks of the Osage section are mainly Pennsylvanian or Permian in age, but in the southwestern section, where CSIA is located, are some Triassic and Cretaceous rocks as well as Pliocene and Pleistocene. Much of the Osage section is described as scarred plains. The geology at CSIA comprises interspersed silty/sandy clays, clayey silts, and clays to depths ranging from 28 to 80 feet below ground surface (bgs). These shallow soil sediments overlie the fine-to-medium grained sandstone of the Elk City sandstone. The Elk City Sandstone ranges in thickness from 70 to 132 feet, generally increasing in thickness from the southeast to the northwest. The Doxey Shale is encountered at depths ranging from 135 to 167 feet bgs (USACE 2000).

3.3.4.2 Topography

The topography ranges from nearly featureless plain and low escarpments a few hundred feet high, to bold escarpments that rise as much as 600 feet above adjacent plains (USACE 1994). A review of the USGS topographic quadrangle for the area shows the property as relatively flat, with elevations ranging from 1,935 feet msl at the western edge to 1,921 msl at the at the northeast corner.

3.3.4.3 Soils

Soil surveys indicate that the area is not particularly suitable for trees, and only Clairemont soils on CSIA have good potential to support shrubs. Flat grasslands and shallow gullies characterize CSIA. The grasses are mainly Bermuda and weeping love and CSIA is surrounded primarily by agricultural fields (USAF 2002a). No hydric soils are present at CSIA.

3.3.5 Water Resources

3.3.5.1 Surface Water

The predominant surface water feature at CSIA is Base Lake, which is created by a man-made barrier or dike designated to obstruct the flow of water. A review of topographic maps and aerial photographs for the proposed ALZ area did not identify surface water.

3.3.5.2 Groundwater

The shallow groundwater zone comprises silts and clays down to the top of the Elk City Sandstone. The intermediate zone consists of the upper portion of the Elk City Sandstone, while the deep zone is the lower portion of the Elk City Sandstone, immediately over the Doxey Shale. The Elk City Sandstone is the major supply aquifer in the vicinity of CSIA and provides water for municipal, irrigation, and industrial use. Groundwater is first encountered in the silty/sandy clays overlying the Elk City Sandstone. Measurements of groundwater movement were taken in 1994 of shallow, intermediate, and deep wells. Shallow wells were completed in the soils above the Elk City Sandstone, intermediate wells were completed in the Elk City Sandstone, but did not penetrate the Doxey Shale, and the deep wells penetrated the Doxey Shale. The groundwater gradient in the shallow wells was 0.0048 feet/feet (ft/ft) to the SE. The groundwater gradient in the intermediate wells was 0.0091 ft/ft to the SE, and in the deep wells was 0.0039 ft/ft to the south (USACE 1998).

3.3.6 Hazardous Materials and Wastes

3.3.6.1 Hazardous Materials

Hazardous material management at CSIA for the ALZ areas would comply with all state and federal regulations as discussed in Section 3.1.6.1.

3.3.6.2 Hazardous Waste

All hazardous waste generated at CSIA is required to be handled, stored, transported, disposed, or recycled in compliance with applicable state and federal regulations as discussed in Section 3.1.6.2 of this document. Currently there are five organizations on or near CSIA that generate hazardous waste and are listed in the USEPA RCRA Info Database as RCRA Identification Sites:

- Clinton-Sherman Aviation (USEPA Identification OKD987070547 and OKR000016311);

- Halliburton Energy Service (USEPA Identification OK0000873653);
- Montigo Enterprises Inc. (USEPA Identification OKR000004986);
- West Fab Co (USEPA Identification OKD987079951); and
- Western Vo-Tech School (USEPA Identification OKD981903891) (RCRA 2003).

3.3.6.3 Installation Restoration Program

As a former DoD installation, CSIA has undergone several remedial investigations involving groundwater and soil contamination due to past industrial and aviation activities. These investigations were designed to identify the locations and contents of past toxic and hazardous material disposal and spill sites and eliminate the hazards to public health in an environmentally responsible manner. Although the investigations were not conducted as part of the Air Force's IRP program, the investigations were carried out under the same regulatory requirements and provisions discussed in Section 3.1.6.3 of this document.

The first investigation at CSIA was conducted in March and April 1992, a second in December 1992 and January 1993, a third investigation in November and December 1994, and a fourth in June 1995. The primary contaminants found in the groundwater were organics (trichloroethylene) and petroleum products. As part of the remediation of the area, the USACE has removed approximately 19 underground storage tanks, four above ground storage tanks, and about a mile of pipeline. Two drinking water wells were taken out of service, and six public water supply wells were installed (ODEQ 2001).

In 1999 further remedial studies and investigations were initiated at CSIA. A 1999 investigation and analysis revealed elevated levels of metals in the soil and VOCs in the groundwater. In 2000 a final remedial decision was made to remove all contaminated soils and to allow monitored natural attenuation to be used until remedial action objectives are met. Both remedial solutions began in 2002 (ODEQ 2003).

3.3.6.4 Lead-based Paint and Asbestos

Lead-based paint and asbestos management at CSIA would comply with the requirements defined in Section 3.1.6.4. If lead-based paint and/or asbestos is detected in a building prior to an action and is determined to be a potential hazard or threat, appropriate abatement and disposal activities would be implemented in accordance with applicable federal, state, and local regulations.

3.3.7 Biological Resources

3.3.7.1 Vegetation

Trees are sparse in the CSIA, but some planted trees do grow in landscaped areas such as the former base housing area on the northeast corner of the site. Scattered shin oak and mesquite trees also grow on the banks of Little Elk Creek and its tributaries on the east side of the site. Soil surveys indicate that the area is not particularly suitable for trees, and only

Clairemont soils on the Airpark have good potential to support shrubs. The CSIA is characterized by flat grasslands and shallow gullies. The grasses are mainly Bermuda (*Cynodon dactylon)* and weeping love *(Eragrostis curvula)* (USAF 2002a). The CSIA is surrounded primarily by agricultural fields.

3.3.7.2 Wildlife

A site visit conducted in 2002 revealed numerous and abundant wildlife in nearby wetlands and upland habitats to the west of the CSIA, where the aircraft noise is primarily focused. Numerous species of birds and indications of mammals were seen throughout the area surrounding the nearly 2.5-mile runway. The CSIA and vicinity have experienced high aircraft noise levels since World War II, yet wildlife continue to thrive in these areas, apparently accustomed to the intermittent elevated noise levels (USAF 2002a).

CSIA does not have a BASH program to track bird-aircraft strike occurrences. Bird-aircraft strikes that involve Altus AFB and Vance AFB aircraft during operations at the CSIA are reported to the BASH program manager at the respective base.

3.3.7.3 Threatened and Endangered Species

The Oklahoma Department of Wildlife indicated that no field surveys have been conducted on this specific site, and therefore the department cannot address the potential impact of activities on threatened or endangered wildlife species. However, it suggested that the endangered whooping crane (*Grus Americana)* might be found in or near wetlands on the project area during its spring and fall migrations. No other threatened or endangered species are likely to use this site, although several state species of special concern, such as the Texas horned lizard *(Phrynosoma cornutum)*, earless lizard *(Cophosaurus texanus)*, western big-eared bat *(Plecotus townsendi)*, Swainson's hawk *(Buteo swainsonii)*, and loggerhead shrike *(Lanius ludovicianus)*, may be present (USAF 2002a).

The Oklahoma Natural Heritage Inventory did not identify any endangered species (federal or state) or other rare species or communities on or near this site. In addition, according to the U.S. Fish and Wildlife Service, no federally listed species are known to occur in the immediate vicinity of the CSIA (USAF 2002a).

3.3.7.4 Wetlands

The wetlands on CSIA are concentrated along the tributaries of Little Elk Creek. Base Lake is classified as part of a palustrine system, which includes small, shallow, permanent or intermittent water bodies. The vegetation class of the system is broad-leaved deciduous. The system has surface water present for brief periods during the growing season and is classified as temporarily flooded; Base Lake is created or modified by a man-made barrier or dike designated to obstruct the flow of water (USAF 2002a).

Base Lake is classified as palustrine, unconsolidated bottom (nonvegetated class), and permanently flooded. Along the edges of the tributaries, the wetland classification is palustrine, unconsolidated shore, seasonally and permanently flooded (USAF 2002a).

3.3.7.5 Floodplains

Washita County is not a participant in the NFIP. In participating communities, the extent of SFHAs are determined and published in FIRMs by FEMA. Based on the field survey accomplished during the preparation of this EA, floodplains do not appear to exist in the area.

3.3.8 Cultural Resources

The Oklahoma State Historic Preservation Office and the OAS were consulted on the potential for cultural resources within the project area. In February 2003, the OAS informed Altus AFB that an Archeological Survey of the property was not required. However, the OAS recommended consultation with the SHPO related to historic archeological sites and historic structural properties. Consultation with the SHPO is underway.

3.3.9 Socioeconomics

3.3.9.1 Population

The population of Washita County was 11,508 in 2000. The estimated population in 2001 was 11,473 indicating a 0.3 percent decline in the overall population of the area. Since 1990 the county has experienced a 0.6 percent decline. The county consists of 1,003 square miles with a population density of 11.5 people per square mile (USCB 2003). The county seat of Washita County is Cordell, Oklahoma. The population of Cordell Oklahoma was 2,903 in 1990 (Cordell 2003).

3.3.9.2 Housing

There were 5,452 housing units in Washita County identified in the 2000 census. The average value of an owner-occupied unit in 2000 was $39,800 with a home-ownership rate of 74.7 percent (USCB 2003).

3.3.9.3 Education

There are five school districts in Washita County, Oklahoma: Cordell School District, Burns Flat-Dill School District, Canute School District, Sentinel School District, and Washita Heights School District. Twenty-five percent of the population of Washita County resides in Cordell, Oklahoma with a property tax rate of $78.69 per $1,000 assessed value for the year 1998-1999 (Cordell 2003b).

3.3.9.4 Economy

The average household income as identified by the 2000 census for Washita County is $29,562, with a per capita income of $15,528. Less than 16 percent of the residents of

Washita County live at or below poverty as defined by the US Census Bureau. Retail sales for 1997 for Washita County were estimated at $46,212,000 resulting in a per capita retail sales of $3,975 (USCB 2003).

3.4 AMARILLO INTERNATIONAL AIRPORT

3.4.1 Noise

Amarillo IAP is located in Amarillo, Texas, approximately 150 miles west-northwest of Altus AFB. The airport supports air carrier, air taxi, and general aviation operations, as well as providing support to military aircraft transiting the region and conducting training at the field.

Under current conditions, Amarillo IAP supports more than 109,500 annual aviation operations. Average daily operations at the facility are shown in Table 3-17. Land areas and population exposed to elevated noise levels are described in Table 3-18, and noise contours are illustrated in Figure 3-9. The flight tracks of aircraft flown at, and in the immediate vicinity of Amarillo IAP are shown in Figure 3-10.

Table 3-17 Average Daily Operations, Baseline Conditions, Amarillo International Airport

Aircraft	Arrivals		Departures		Closed Patterns[1]	
	Day	Night	Day	Night	Day	Night
Air Carrier	12.409	0.792	12.409	0.792	0.000	0.000
Air Taxi	20.307	0.846	20.307	0.846	0.000	0.000
Gen. Aviation	31.283	0.639	31.283	0.639	4.966	0.000
C-5	3.802	0.038	3.802	0.038	4.036	0.000
C-17	0.000	0.000	0.000	0.000	0.000	0.000
KC-135R	9.504	0.096	9.504	0.096	10.090	0.000
Other Military	24.711	0.250	24.711	0.250	26.234	0.000
Total	**102.016**	**2.661**	**102.016**	**2.661**	**45.326**	**0.000**

Source: Amarillo IAP 2003
Note: Daily operations are based on averages of annual operations; therefore, numbers do not round.
[1] Since closed patterns are essentially an arrival and takeoff, the 45.362 closed patterns shown equate to 90.724 aviation operations.

Table 3-18 Land Area Exposed to Indicated Sound Levels, Baseline Conditions, Amarillo International Airport

Condition	Day-Night Average Noise Level (L_{dn}dBA)					
	65-70	70-75	75-80	80-85	85+	Total
Amarillo IAP						
Acres	5,206.7	2,697.8	1,378.0	525.7	511.7	**10,319.9**
Population [1]	113	36	15	1	0	**165**
Persons Annoyed [2]	19	10	7	0		**36**

Note: [1] Population exposed is estimated based on census tract population data, and the relative proportion of the tract encompassed by given contour levels.
[2] Persons expected to be annoyed is estimated based on total population exposed, and the average percentage of that population expected to be annoyed by the indicated noise level (see Table 3-3).
Source: Moulton 1990

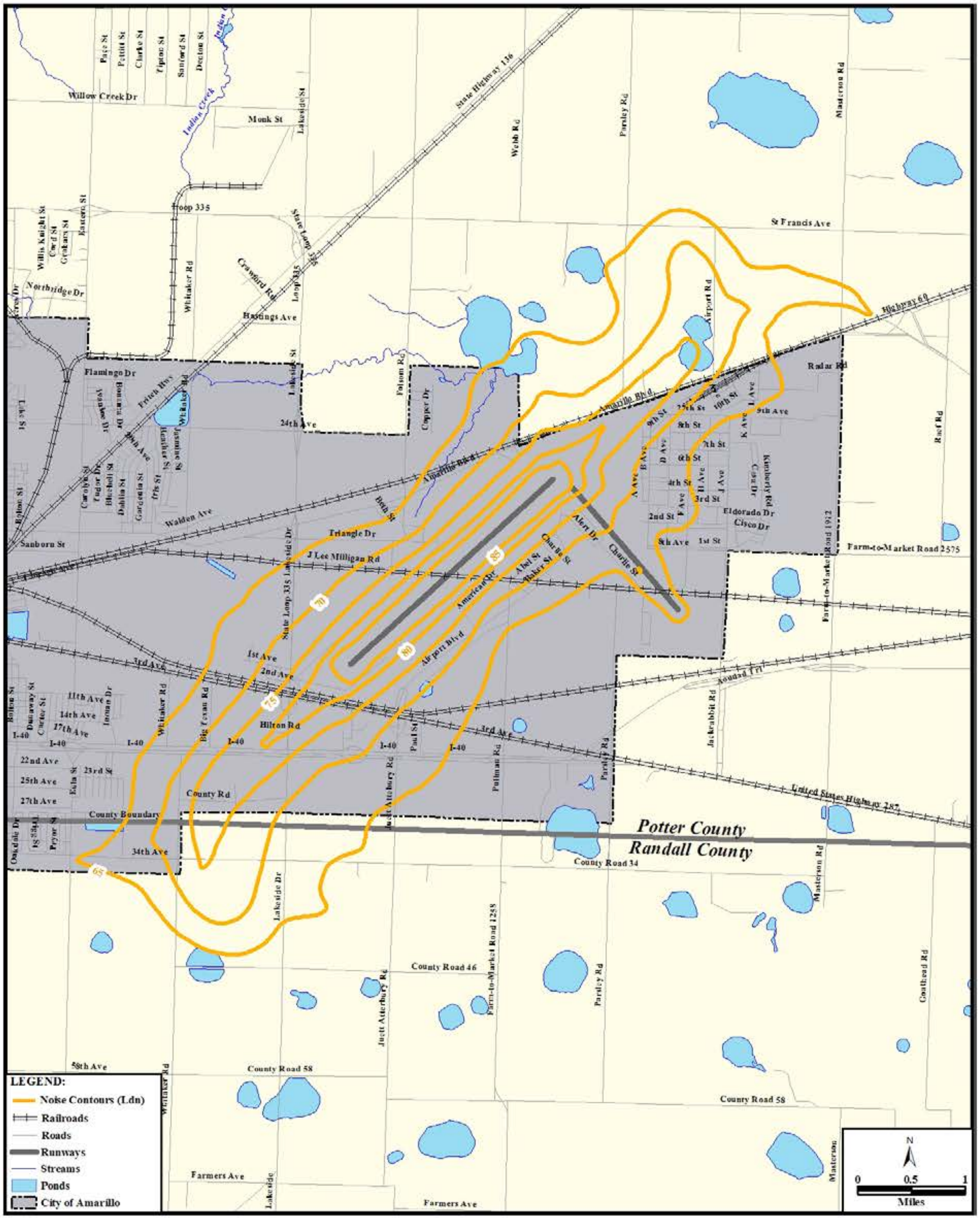


Figure 3-9 Baseline Noise Contours, Amarillo International Airport

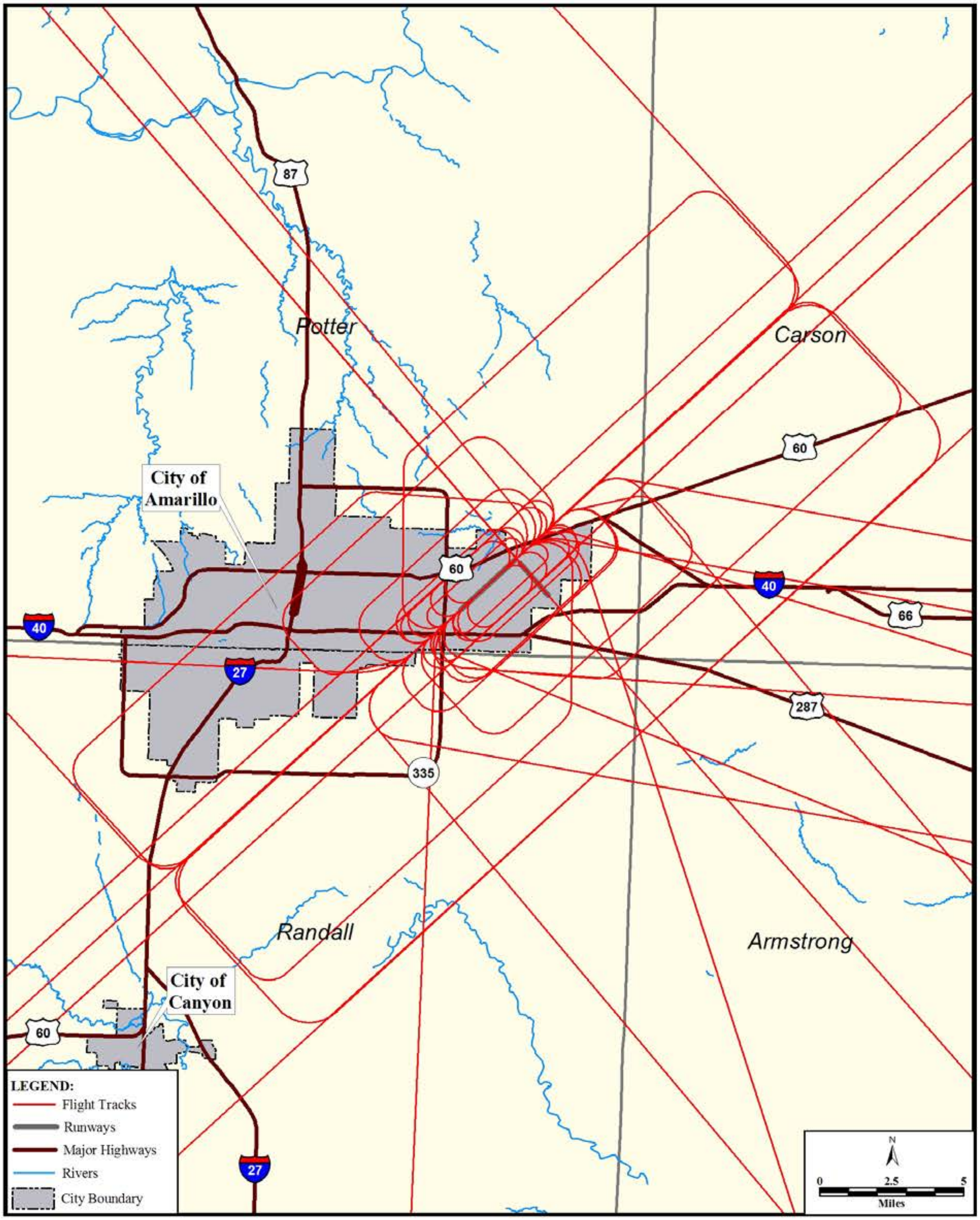


Figure 3-10 Aircraft Flight Tracks, Amarillo International Airport

3.4.2 Air Quality

The ROI for Amarillo IAP includes the area around the airport in Potter County, Texas.

3.4.2.1 Meteorology

The average annual mean temperature for Amarillo IAP is 56.9 degrees Fahrenheit (°F). The average temperature during the summer months is 80.1°F, and the average mean temperature during the winter is 39.5°F. The predominant wind direction is from the southwest. The average wind velocity is 13.6 miles per hour.

The meteorological conditions in the vicinity of Amarillo IAP are extremely diverse. As discussed for Altus AFB in Section 3.1.3.1, location is an important factor in regional weather conditions. Maritime tropical air masses from the Gulf of Mexico move seasonally over the eastern portion of North America. The north-central part of Mexico spawns dry, hot continental air masses. These two air masses dominate the weather activity of western Texas, which may change suddenly and with little warning.

3.4.2.2 Air Pollutants and Regulations

The same air pollutants and regulations discussed in Section 3.1.3.2 would apply to the ROI for Amarillo IAP. The nearest PSD Class I area to the proposed site is the Wichita Mountains Wilderness, which is located more than 100 miles east of Amarillo IAP.

3.4.2.3 Regional Air Quality

Amarillo IAP is located within the Amarillo-Lubbock Intrastate AQCR 211. All counties within AQCR 211 are classified by the EPA as attainment or unclassified for all criteria pollutants.

3.5 LUBBOCK INTERNATIONAL AIRPORT

3.5.1 Noise

Lubbock IAP is located in Lubbock, Texas, approximately 160 miles west-southwest of Altus AFB. The airport supports air carrier, air taxi, and general aviation operations, as well as providing support to military aircraft transiting the region and conducting training at the field.

Under current conditions, Lubbock IAP supports more than 90,000 annual aviation operations. Average daily operations at the facility are shown in Table 3-19. Land areas and population exposed to elevated noise levels are described in Table 3-20, and noise contours are illustrated in Figure 3-11. The flight tracks of aircraft flown at, and in the immediate vicinity of Lubbock IAP, are shown in Figure 3-12.

Table 3-19 Average Daily Operations, Baseline Conditions, Lubbock International Airport

Aircraft	Arrivals		Departures		Closed Patterns[1]	
	Day	**Night**	**Day**	**Night**	**Day**	**Night**
Air Carrier	18.836	1.638	18.836	1.638	0.000	0.000
Air Taxi	26.582	2.311	26.582	2.311	0.000	0.000
Gen. Aviation	22.874	1.989	22.874	1.989	17.196	0.000
C-5	0.000	0.000	0.000	0.000	0.000	0.000
C-17	0.878	0.076	0.878	0.076	0.655	0.000
KC-135R	1.755	0.153	1.755	0.153	1.310	0.000
Other Military	14.920	1.297	14.920	1.297	11.134	0.000
Total	**85.845**	**7.764**	**85.845**	**7.764**	**30.295**	**0.000**

Note Daily operations are based on averages of annual operations; therefore, numbers do not round.
[1] Since closed patterns are essentially an arrival and takeoff, the 30.295 closed patterns shown equate to 60.590 aviation operations.
Source: Lubbock IAP 2003

Table 3-20 Land Area Exposed to Indicated Sound Levels, Baseline Conditions, Lubbock International Airport

Condition	Day-Night Average Noise Level (L_{dn}dBA)					
	65-70	**70-75**	**75-80**	**80-85**	**85+**	**Total**
Lubbock IAP						
Acres	1,602.0	738.8	329.5	171.6	45.6	**2,887.5**
Population [1]	545	1	0	0	0	**546**
Persons Annoyed [2]	93	0	0	0	0	**93**

Note: [1] Population exposed is estimated based on census tract population data, and the relative proportion of the tract encompassed by given contour levels.
[2] Persons expected to be annoyed is estimated based on total population exposed, and the average percentage of that population expected to be annoyed by the indicated noise level (see Table 3-3).
Source: NOISEMAP; USCB 2002

3.5.2 Air Quality

The ROI for Lubbock IAP includes the area around the airport in Lubbock County, Texas.

3.5.2.1 Meteorology

The meteorological conditions in the vicinity of Lubbock IAP are extremely diverse. As discussed for Altus AFB in Section 3.1.3.1, location is an important factor in regional weather conditions. Maritime tropical air masses from the Gulf of Mexico move seasonally over the eastern portion of North America. The north-central part of Mexico spawns dry, hot continental air masses. These two air masses dominate the weather activity of western Texas, which may change suddenly and with little warning.

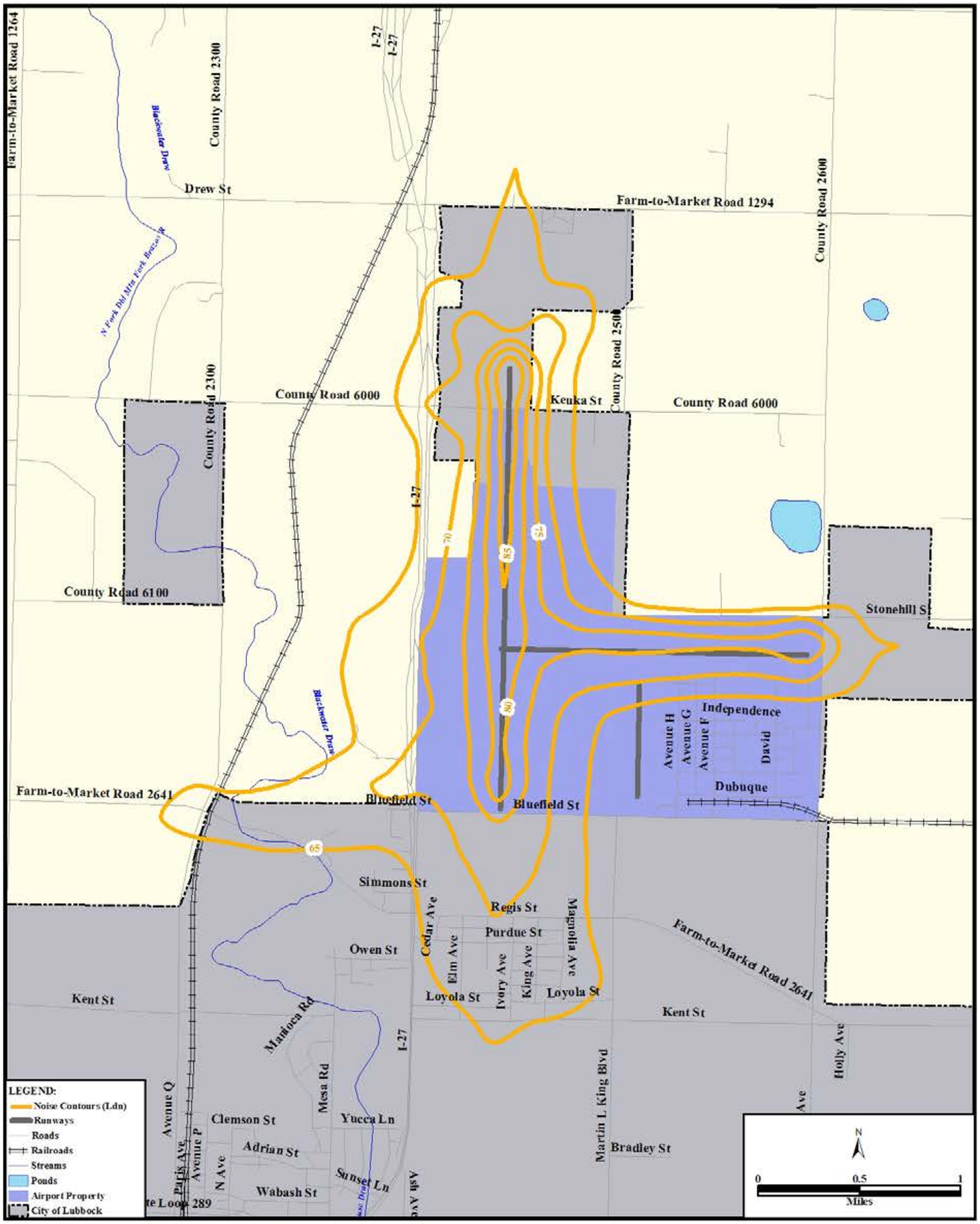


Figure 3-11 Baseline Noise Contours, Lubbock International Airport

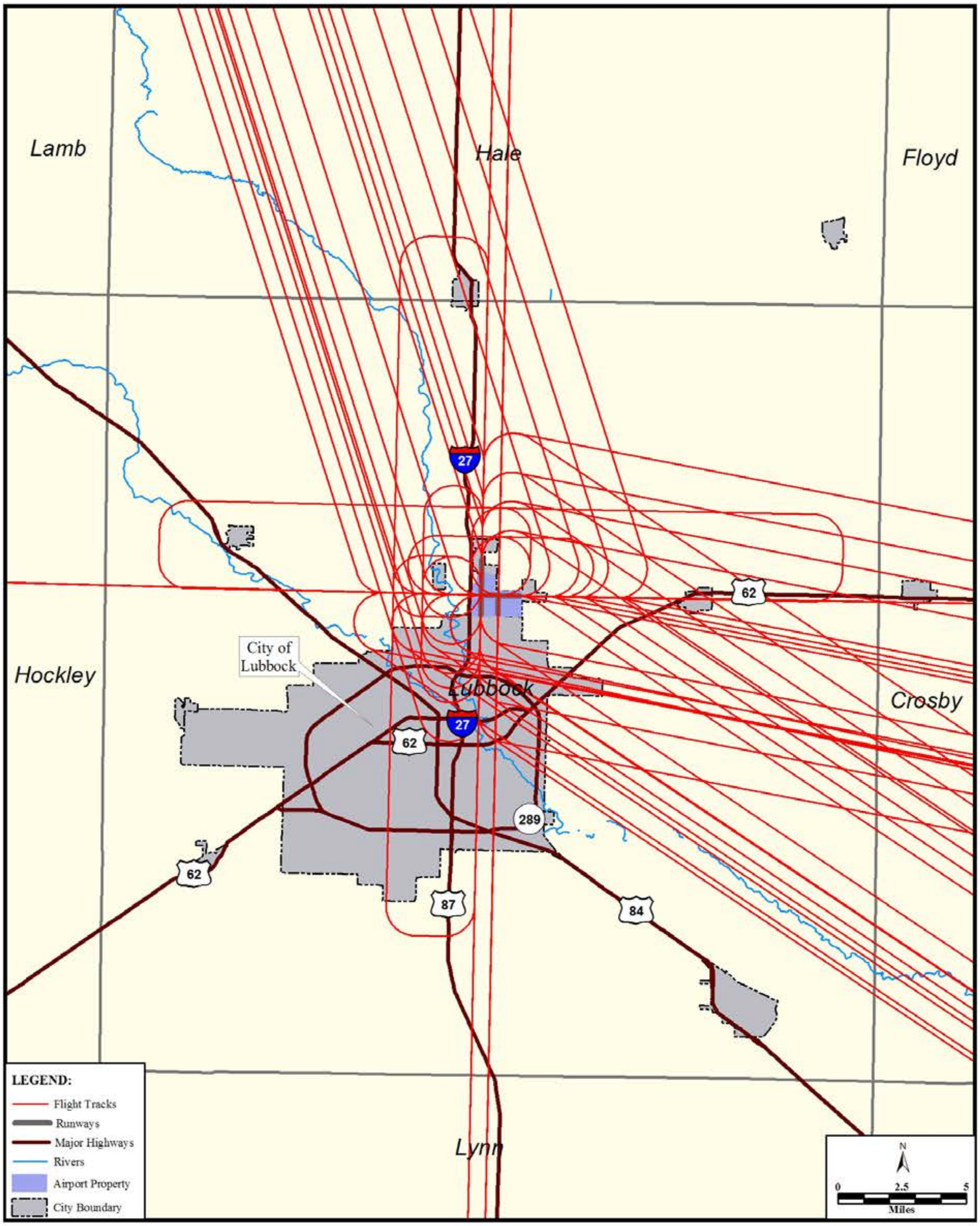


Figure 3-12 Aircraft Flight Tracks, Lubbock International Airport

The average annual mean temperature for Lubbock IAP is 56.9 °F. The average temperature during the summer months is 80.1°F, and the average mean temperature during the winter is 39.5°F. The predominant wind direction is from the southwest. The average wind velocity is 13.6 miles per hour.

3.5.2.2 Air Pollutants and Regulations

The same air pollutants and regulations discussed in Section 3.1.3.2 would apply to the ROI for Lubbock IAP. The nearest PSD Class I area to the proposed site is the Wichita Mountains Wilderness, which is located more than 100 miles east of Lubbock IAP.

3.5.2.3 Regional Air Quality

Lubbock IAP is located within the Amarillo-Lubbock Intrastate AQCR 211. All counties within AQCR 211 are classified by the EPA as attainment or unclassified for all criteria pollutants.

CHAPTER 4

ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION

This chapter describes potential impacts for each resource area that could occur if the proposed action is implemented at Altus AFB, Sooner DZ, CSIA, Amarillo IAP, and Lubbock IAP. Cumulative impacts are analyzed for each resource for the projects identified in Section 2.7. The methodology for analyzing potential impacts is discussed at the beginning of each topic of analysis. This chapter is organized by location (i.e., Altus AFB, Sooner DZ, CSIA, Amarillo IAP, and Lubbock IAP).

4.2 CHANGE IN CURRENT MISSION

The primary missions of Altus AFB would continue. However, the result of additional C-17 aircraft, establishment of MPD training, and associated construction projects would allow Altus AFB to more effectively meet mission requirements. The primary use of CSIA for general aviation would continue; however, NVG training would also be accomplished at the airpark. There would be no change to current airport procedures to allow for NVG training and conflicts with general aviation aircraft would not occur. In addition, OSIDA currently plans to utilize existing storage bunkers, construct a rocket engine test cell near the proposed ALZ sites, and construct a vertical launch pad and launch control building near the proposed ALZ sites, which may conflict with construction and operation of an ALZ.

4.3 DESCRIPTION OF THE EFFECTS OF ALL ALTERNATIVES ON THE AFFECTED ENVIRONMENT FOR ALTUS AIR FORCE BASE

4.3.1 Noise

Noise, often defined as unwanted sound, is one of the most common environmental issues associated with aircraft operations. Concerns regarding aircraft noise relate to certain potential impacts such as hearing loss, non-auditory health effects, annoyance, speech interference, sleep interference, and effects on domestic animals, wildlife, structures, terrain, and historic and archaeological sites. A general discussion of noise and noise effects is presented in Appendix A.

In evaluating noise impacts, several items were examined, including: 1) the degree to which noise levels generated by construction and demolition activities were higher than the ambient noise levels; 2) the noise levels resulting from aircraft operations; 3) the degree to which there is annoyance and/or activity interference; and 4) the proximity of noise-sensitive receptors to the noise source.

The primary means of assessing environmental noise is through computer simulations since direct measurement of noise levels is often impractical, expensive, and inconclusive.

Additionally, direct measurement would require actual implementation of the action prior to an analysis and decision which would be impractical and contrary to NEPA. Unlike a topographic contour, noise contours are not intended to be precise representations of the noise zones. Geographic features, meteorology, the receiver's perception of the source, etc., can influence the impact of noise. Noise contours do not clearly divide noise zones with one side of the line compatible and the other side incompatible. However, the use of noise contour maps has proven to be a reliable planning tool in noise affected areas.

Noise levels resulting from all aviation activities were modeled using the Air Force's BASEOPS/NOISEMAP model or MR_NMAP model, as appropriate. Noise levels associated with operations in the airfield environment and in the military training airspace resulting from the proposed action and alternatives was calculated and compared with current conditions to assess impacts. Data developed during this process will also support analyses in other resource areas.

Based on numerous sociological surveys and recommendations of federal interagency councils, the most common benchmark referred to is a Day-Night Average Sound Level of 65 dBA. This threshold is often used to determine residential land use compatibility around airports or highways. By extension, it is often used as a criterion in airspace planning. Two other average noise levels are also useful:

- A Day-Night Average Noise Level of 55 dBA was identified by the USEPA as a level "...requisite to protect the public health and welfare with an adequate margin of safety" (USEPA 1974). Noise may be heard, but there is no risk to public health or welfare.
- A Day-Night Average Noise Level of 75 dBA is a threshold above which effects other than annoyance may occur. It is 10 to 15 dBA below levels at which hearing damage is a known risk (OSHA 1983). However, it is also a level above which some adverse health effects can not be categorically discounted.

Public annoyance is the most common impact associated with exposure to elevated noise levels. When subjected to Day-Night Average Sound Levels of 65 dBA, approximately 12 percent of persons so exposed will be "highly annoyed" by the noise. At levels below 55 dBA, the percentage of annoyance is correspondingly lower (less than three percent). The percentage of people annoyed by noise never drops to zero (some people are always annoyed), but at levels below 55 dBA it is reduced enough to be essentially negligible.

4.3.1.1 Proposed Action

In order to develop the most conservative scenario, it is assumed that delivery of additional C-17 aircraft to Altus AFB is accelerated, and C-5 aircraft are still present at Altus AFB. In the analyses below, this is referred to as the "Peak Condition," in which peak refers to the presence of all three aircraft (i.e., C-5s, C-17s, and KC-135s) operating at the location. However, the more probable situation is that additional C-17 aircraft are delivered as programmed, and C-5 aircraft cease operations at Altus AFB. This situation is described as the "End-State" condition. By presenting these two conditions, the analyses bound the proposals. At any one

point in time during the transition phase, noise exposure would be expected to be between the two conditions.

Factors considered in the noise analysis around the proposed airfields and the input requirements for the Air Force's BASEOPS/NOISEMAP model were discussed in Section 3.1.2. Under the proposed action, approximately 354 daily aviation operations would be conducted from Altus AFB during the peak condition (while all three aircraft are present at the base), and approximately 357 daily operations would be conducted in the end-state condition (after the departure of the C-5 aircraft and the increase in C-17 aircraft operations). The number of daily arrivals and departures for both the C-17 and KC-135 aircraft would be the same under the peak and end-state conditions. However, closed pattern operations would increase under the end-state condition. These levels reflect an approximate 30 percent reduction from baseline conditions and are presented in Tables 4-1 and 4-2.

Table 4-1 Average Daily Operations, Peak Condition, Proposed Action, Altus Air Force Base

	Arrivals		Departures		Closed Patterns[1]	
Aircraft	**Day**	**Night**	**Day**	**Night**	**Day**	**Night**
C-5	4.897	0.786	5.683	0.000	4.647	0.040
C-17	18.992	9.437	20.825	7.603	81.389	31.920
KC-135R	9.833	2.167	12.000	0.000	9.838	1.952
Transients	1.030	0.000	1.030	0.000	0.000	0.000
Total	**34.752**	**12.390**	**39.538**	**7.603**	**95.874**	**33.912**

Note: Daily operations are based on averages of annual operations; therefore, numbers do not round.
[1] - Since closed patterns are essentially an arrival and takeoff, the 129.786 closed patterns shown equate to 259.572 aviation operations.

Table 4-2 Average Daily Operations, End-State Condition, Proposed Action, Altus Air Force Base

	Arrivals		Departures		Closed Patterns[1]	
Aircraft	**Day**	**Night**	**Day**	**Night**	**Day**	**Night**
C-17	18.992	9.437	20.825	7.603	81.389	31.920
KC-135	9.833	2.167	12.000	0.000	19.671	3.901
Transient	1.030	0.000	1.030	0.000	0.000	0.000
Total	**29.855**	**11.604**	**33.855**	**7.603**	**101.060**	**35.821**

Note: Daily operations are based on averages of annual operations; therefore, numbers do not round.
[1] - Since closed patterns are essentially an arrival and takeoff, the 136.881 closed patterns shown equate to 273.762 aviation operations.

The land areas and population exposed to elevated noise levels are compared with current conditions in Tables 4-3 and 4-4 and the noise contours resulting from these changed operations are illustrated in Figures 4-1 and 4-2.

Tables 4-3 and 4-4 show that reductions in exposure result in both the peak and end-state conditions, with greater reductions being realized in the end-state. These reductions result from the cessation of all C-5 operations from Altus. While overall reductions result on Altus AFB,

Table 4-3 Change in Land Areas Exposed to Indicated Sound Levels, Peak Condition, Proposed Action, Altus Air Force Base

Condition	Day-Night Average Noise Level (L_{dn}dBA)					
	65-70	**70-75**	**75-80**	**80-85**	**85+**	**Total**
On Altus AFB						
Acres						
Baseline	301.5	298.6	730.0	959.8	1,101.3	**3,391.2**
Proposed Peak	320.0	627.2	1,369.6	601.6	288.0	**3,206.4**
Change	18.5	328.6	639.6	-358.2	-813.3	**-184.8**
Population						
Baseline	207	263	447	447	653	**2,017**
Proposed Peak	263	441	635	301	249	**1,889**
Change	56	178	188	-146	-404	**-128**
Persons Annoyed[1]						
Baseline	35	76	201	277	457	**1,046**
Proposed Peak	45	128	286	187	174	**820**
Change	10	52	85	-90	-283	**-226**
Off Altus AFB						
Acres						
Baseline	10,189.7	8,186.4	2,164.1	617	18	**21,175.2**
Proposed Peak	6,720	2,220.8	1,048.6	38.4	0	**10,027.8**
Change	-3,469.7	-5,965.6	-1,115.5	-578.6	-18	**-11,147.4**
Population						
Baseline	258	200	87	47	0	**592**
Proposed Peak	188	101	55	0	0	**344**
Change	-70	-99	-32	-47	0	**-248**
Persons Annoyed[1]						
Baseline	44	58	39	29	0	**170**
Proposed Peak	32	29	25	0	0	**86**
Change	-12	-29	-14	-29	0	**-84**

Source: NOISEMAP; USCB 2002
[1] - Estimated based on average annoyance levels for indicated exposure.

there is increased exposure in the 65 to 80 L_{dn} range. However, reductions occur in the higher noise regimes (greater than 80 L_{dn}). Off-base, reductions are greater. At all noise levels, land area and population exposed to elevated noise levels are reduced. Overall, summary data for the proposed action indicate reduced exposure to elevated noise levels, and generally positive noise impacts.

Table 4-4 Change in Land Areas Exposed to Indicated Sound Levels, End-State Condition, Proposed Action, Altus Air Force Base

Condition	Day-Night Average Noise Level (L_{dn}dBA)					
	65-70	**70-75**	**75-80**	**80-85**	**85+**	**Total**
On Altus AFB						
Acres						
Baseline	301.5	298.6	730.0	959.8	1,101.3	**3,391.2**
Proposed End	384.0	908.8	1,129.2	492.8	83.2	**2,998.0**
Change	82.5	610.2	399.2	-467	-1,018	**-393.2**
Population						
Baseline	207	263	447	447	653	**2,017**
Proposed End	314	604	479	260	84	**1741**
Change	107	341	32	-187	-569	**-276**
Persons Annoyed[1]						
Baseline	35	76	201	277	457	**1,046**
Proposed End	53	175	216	161	59	**664**
Change	18	99	15	-116	-398	**382**
Off Altus AFB						
Acres						
Baseline	10,189.7	8,186.4	2,164.1	617	18	**21,175.2**
Proposed End	3,174.4	1,433.6	422.4	0	0	**5,030.4**
Change	-7,015.3	-6,752.8	-1,741.7	-617	-18	**-16,144.8**
Population						
Baseline	258	200	87	47	0	**592**
Proposed End	117	70	39	0	0	**226**
Change	-141	-130	-48	-47	0	**-366**
Persons Annoyed[1]						
Baseline	44	58	39	29	0	**170**
Proposed End	20	20	18	0	0	**58**
Change	-24	-38	-21	-29	0	**-112**

Source: NOISEMAP; USCB 2002
[1] - Estimated based on average annoyance levels for indicated exposure.

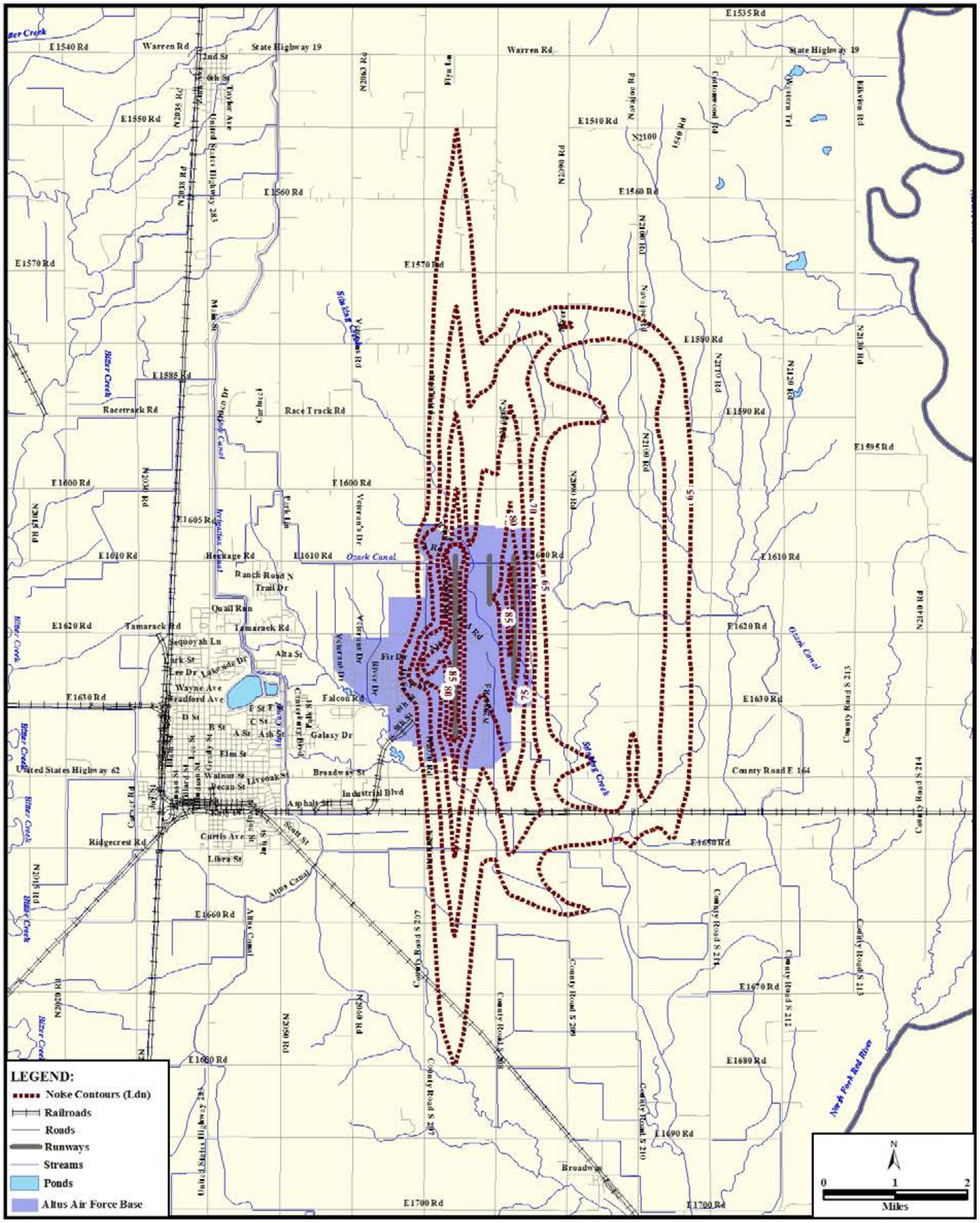


Figure 4-1 Noise Contours, Peak Condition, Proposed Action, Altus Air Force Base

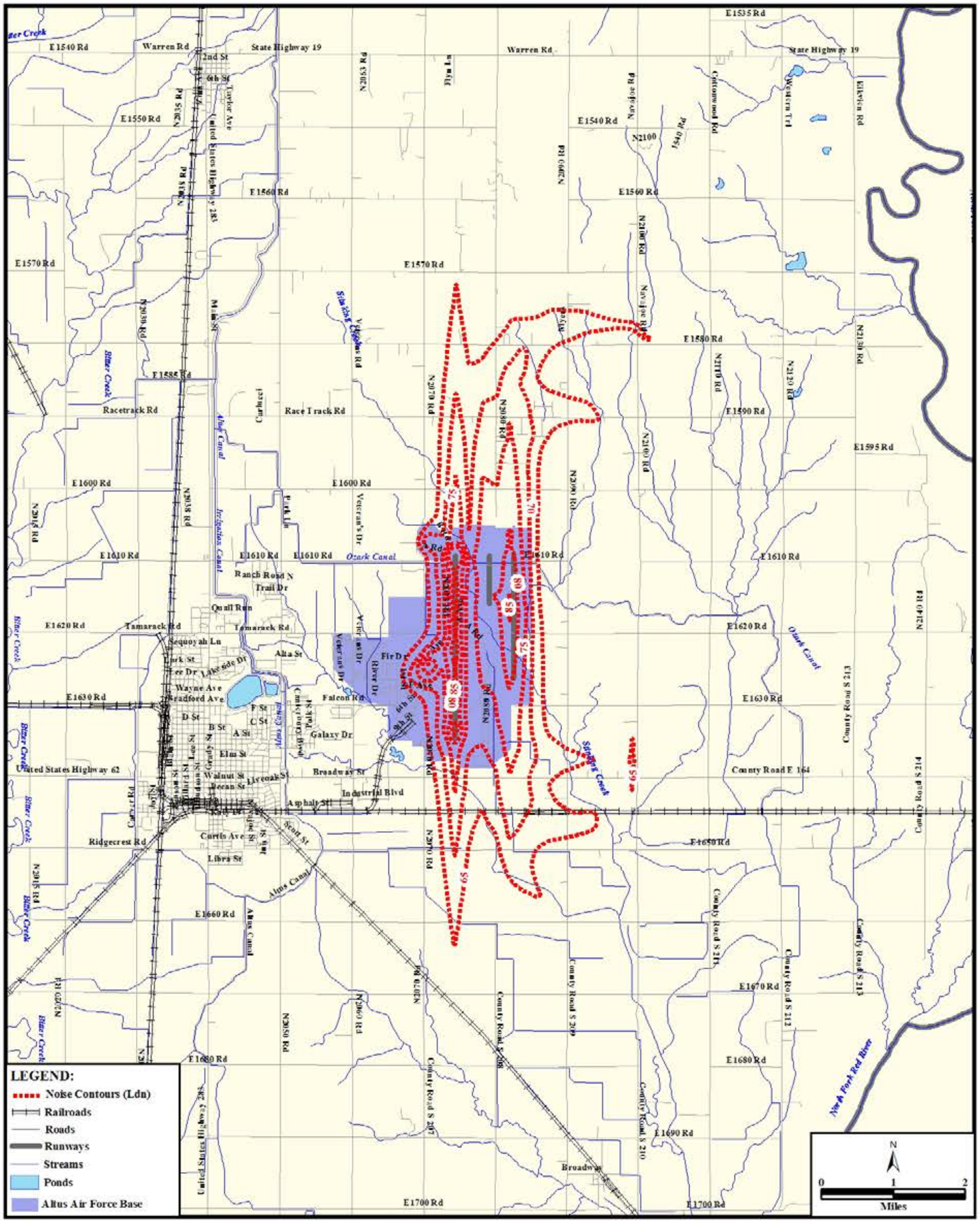


Figure 4-2 Noise Contours, End-State Condition, Proposed Action, Altus Air Force Base

In the peak condition, noise exposure is reduced at all locations. L_{dn} reductions range from 1.6 to 8.2 dBA. At the end-state condition, noise exposure reduction at all locations is greater than the peak condition. L_{dn} reductions range from 2.2 to 11.2 dBA.

Under the proposed action, noise from ground-based activities at the airfields would remain essentially unchanged from current conditions. Also, construction and demolition projects would create noise. However, such noise sources would be localized, intermittent, and of relatively short duration. In addition, noise generated from the construction and demolition projects would typically be masked by the airfield operations. The temporary increase in noise levels would not be expected to impact the overall acoustic characteristics of the ROI.

Military Training Routes

Anticipated noise levels associated with the increased use of the MTRs under the proposed action are compared with current conditions in Table 4-5. As previously discussed, the values presented reflect the mathematically calculated output of the MR_NMAP model. However, background noise in rural areas is normally considered to be approximately 40 dBA or greater. Therefore, although a value is calculated, any such value equal to, or less than 35-40 dBA essentially indicates that there is little or no observable noise contribution from aircraft in the region. Although the introduction of additional C-17 operations in these airspace elements raises noise levels from current conditions, the continuation of generally low values are due to the relatively limited number of increased operations, and the relatively moderate noise contributed by the C-17.

As shown, although the increase in sound levels appears large in some cases, it should be noted that the highest resultant sound level on any segment is L_{dnmr} 50. And, that level is only a 2 dB increase over baseline levels. MTR use results in minimal noise impacts.

4.3.1.2 Alternative Action

Under the alternative action, approximately 357 aviation operations would be conducted from Altus AFB during the peak condition, and approximately 349 operations would be conducted in the end-state condition. C-17 operations remain the same for the peak and end-state conditions. In the end-state, KC-135 operations increase and C-5 operations cease. This Overall, these operations would represent a decrease of 29 percent and 31 percent, respectively, from baseline conditions, when approximately 504 operations were conducted. These operations are shown in Tables 4-6 and 4-7.

The land areas and population exposed to elevated noise levels are compare with current conditions in Tables 4-8 and 4-9 and noise contours resulting from these changed operations are illustrated in Figures 4-3 and 4-4.

Table 4-5 Noise Levels in Military Training Airspace, Proposed Action

Route	Segment	Sound Level in L_{dnmr}		
		Baseline	Proposed	Change
SR-205	A-B	30	46	+16
	B-E	28	44	+16
SR-206	A-B	30	46	+16
	B-E	28	44	+16
SR-208	A-B C-F	28	44	+16
	B-C	31	47	+16
SR-216	All	38	47	+9
SR-217	A-C D-G	48	50	+2
	C-D	50	52	+2
VR-144	A-C E-F	38	44	+6
	C-E	35	41	+6
	Extended	N/A	47	+47
VR-184	A-B D-F	48	50	+2
	B-D	45	47	+2
VR-190	All	48	50	+2
VR-191	All	39	44	+5
VR-198	A-B C-K	28	44	+16
	B-C	25	41	+16
VR-199	A-I J-K	28	44	+16
	I-J	25	41	+16
IR-103	A-D	32	38	+6
	D-F	37	43	+6
IR-154	All	29	43	+14
IR-155	A-B	31	43	+12
	B-K	29	41	+12
	K-N	31	43	+12

Source: MR_NMAP
Note: N/A - Data not available. Indicated segment does not currently exist.

Table 4-6 Average Daily Operations, Peak Condition, Alternative Action, Altus Air Force Base

Aircraft	Arrivals		Departures		Closed Patterns[1]	
	Day	Night	Day	Night	Day	Night
C-5	1.468	0.234	1.706	0.000	13.468	0.175
C-17	10.044	5.956	11.877	4.123	45.302	17.885
KC-135	9.833	2.167	12.000	0.000	59.004	11.698
Transients	1.030	0.000	1.030	0.000	0.000	0.000
Total	**22.375**	**8.357**	**26.613**	**4.123**	**117.774**	**29.758**

Note: Daily operations are based on averages of annual operations; therefore, numbers do not round.
[1] Since closed patterns are essentially an arrival and takeoff, the 147.532 closed patterns shown equate to 295.064 aviation operations.

Table 4-7 Average Daily Operations, End-State Condition, Alternative Action, Altus Air Force Base

Aircraft	Arrivals		Departures		Closed Patterns[1]	
	Day	Night	Day	Aircraft	Day	Night
C-5	0.000	0.000	0.000	0.000	0.000	0.000
C-17	10.044	5.956	11.877	4.123	45.302	17.885
KC-135	9.833	2.167	12.000	0.000	68.834	13.551
Transients	1.030	0.000	1.030	0.000	0.000	0.000
Total	**20.907**	**8.123**	**24.907**	**4.123**	**114.136**	**31.436**

Note: Daily operations are based on averages of annual operations; therefore, numbers do not round.
[1] Since closed patterns are essentially an arrival and takeoff, the 145.572 closed patterns shown equate to 291.144 aviation operations.

Table 4-8 Change in Land Areas Exposed to Indicated Sound Levels, Peak Condition, Alternative Action, Altus Air Force Base

Condition	Day-Night Average Noise Level (L_{dn}dBA)					
	65-70	70-75	75-80	80-85	85+	Total
On Altus AFB						
Acres						
Baseline	301.5	298.6	730.0	959.8	1,101.3	**3,391.2**
Proposed Peak	345.6	1,139.2	825.6	582.4	256.0	**3,148.8**
Change	44.1	840.6	95.6	-377.4	-845.3	**-242.4**
Population						
Baseline	207	263	447	447	653	**2,017**
Proposed Peak	290	697	400	294	176	**1,857**
Change	83	434	-47	-153	-477	**-160**
Persons Annoyed[1]						
Baseline	35	76	201	277	457	**1,046**
Proposed Peak	49	202	180	182	123	**736**
Change	14	126	-21	-95	-334	**-310**

Table 4-8, Continued

Condition	Day-Night Average Noise Level (L_{dn}dBA)					
	65-70	**70-75**	**75-80**	**80-85**	**85+**	**Total**
Off Altus AFB						
Acres						
Baseline	10,189.7	8,186.4	2,164.1	617	18	**21,175.2**
Proposed Peak	8,812.8	2,393.6	646.4	32	0	**11,884.8**
Change	-1,376.9	-5,792.8	-1,517.7	-585	-18	**-9,290.4**
Population						
Baseline	258	200	87	47	0	**592**
Proposed Peak	217	99	48	1	0	**365**
Change	-41	-101	-39	-46	0	**-227**
Persons Annoyed[1]						
Baseline	44	58	39	29	0	**170**
Proposed Peak	37	29	22	0	0	**88**
Change	-7	-29	-17	-28	0	**-82**

Source: NOISEMAP; USCB 2002
[1] – Estimated based on average annoyance levels for indicated exposure.

Table 4-9 Change in Land Areas Exposed to Indicated Sound Levels, End-State Condition, Alternative Action, Altus Air Force Base

Condition	Day-Night Average Noise Level (L_{dn}dBA)					
	65-70	**70-75**	**75-80**	**80-85**	**85+**	**Total**
On Altus AFB						
Acres						
Baseline	301.5	298.6	730.0	959.8	1,101.3	**3,391.2**
Proposed Peak	576.0	1,324.8	704.0	326.4	38.4	**2,969.6**
Change	274.5	1,026.2	-26.0	-633.4	-1062.9	**-421.6**
Population						
Baseline	207	263	447	447	653	**2,017**
Proposed Peak	410	672	334	237	36	**1,689**
Change	203	409	-113	-210	-617	**-328**
Persons Annoyed[1]						
Baseline	35	76	201	277	457	**1,046**
Proposed Peak	70	195	150	147	25	**587**
Change	35	119	-51	-130	-432	**-459**

Table 4-9, Continued

Condition	Day-Night Average Noise Level (L_{dn}dBA)					
	65-70	**70-75**	**75-80**	**80-85**	**85+**	**Total**
Off Altus AFB						
Acres						
Baseline	10,189.7	8,186.4	2,164.1	617	18	**21,175.2**
Proposed Peak	2,476.8	1,081.6	102.4	0	0	**3,660.8**
Change	-7,712.9	-7,104.8	-2,061.7	-617	-18	**-17,514.4**
Population						
Baseline	258	200	87	47	0	**592**
Proposed Peak	109	62	8	0	0	**179**
Change	-149	-138	-79	-47	0	**-413**
Persons Annoyed[1]						
Baseline	44	58	39	29	0	**170**
Proposed Peak	19	18	4	0	0	**41**
Change	-25	-40	-35	-29	0	**129**

Source: NOISEMAP; USCB 2002
[1] – Estimated based on average annoyance levels for indicated exposure.

As shown, reductions in exposure result in both the peak and end-state conditions, with greater reductions being realized in the end-state condition. These reductions result from the cessation of all C-5 operations from Altus.

While overall reductions result on Altus AFB, there is increased exposure in the 65 to 80 L_{dn} range under the peak condition, and in the 65 to 75 L_{dn} range at the end-state. However, under both conditions, reductions occur in the higher noise regimes. Off-base, reductions are even greater. For all noise levels, land area and population exposed to elevated noise levels are reduced. Overall, summary data for the alternative action indicate reduced exposure to elevated noise levels and generally positive noise impacts.

Under the alternative action, noise from ground-based activities at the airfields would remain essentially unchanged from current conditions. Also, construction and demolition projects would create noise. However, such noise sources would be localized, intermittent, and of relatively short duration. In addition, noise generated from the construction and demolition projects would typically be masked by the airfield operations. The temporary increase in noise levels would not be expected to impact the overall acoustic characteristics of the ROI.

Military Training Routes

The anticipated noise levels associated with the alternative action for the MTR is the same as the conditions discussed for the proposed action (Section 4.3.1.1).

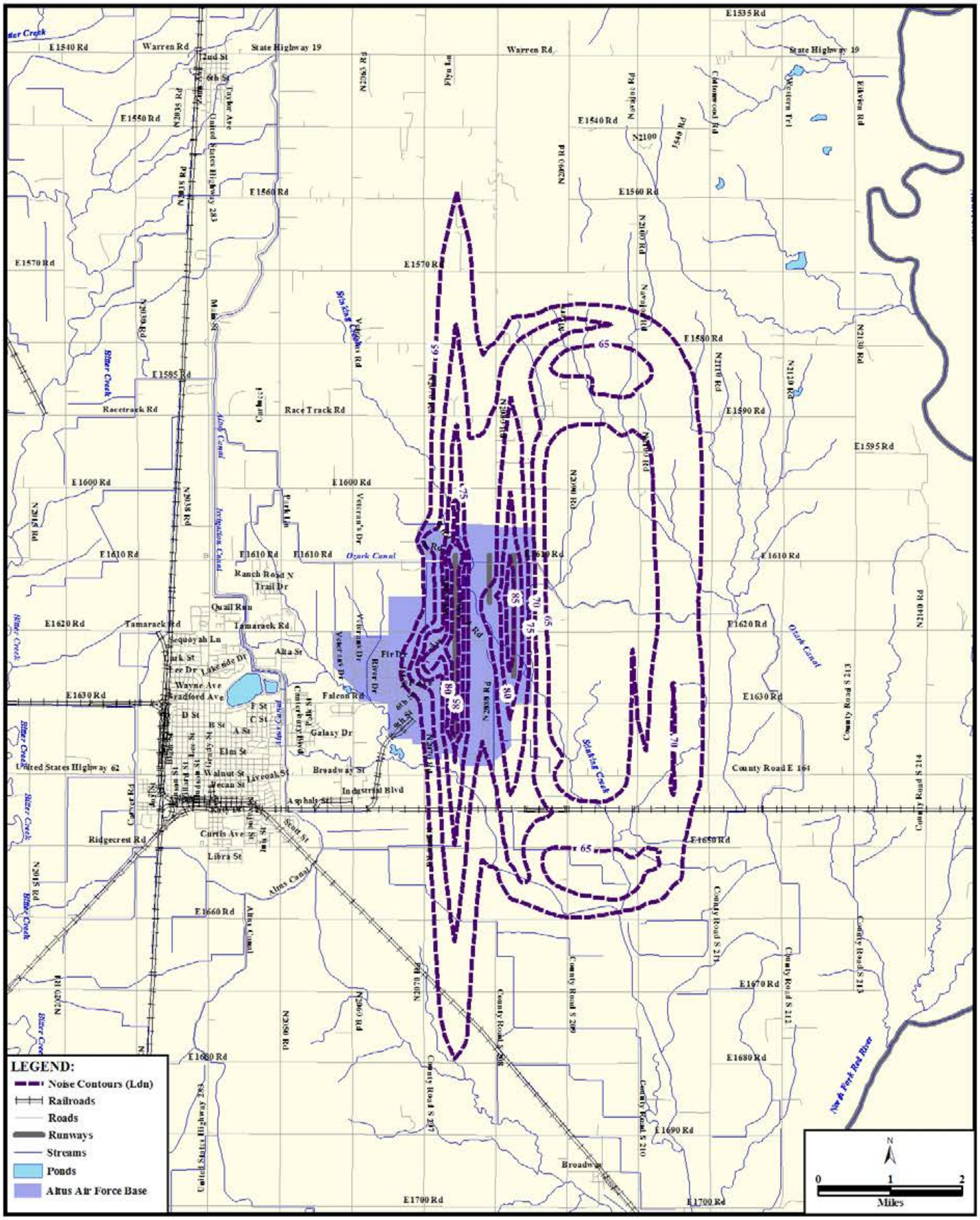


Figure 4-3 Noise Contours, Peak Condition, Alternative Action, Altus Air Force Base

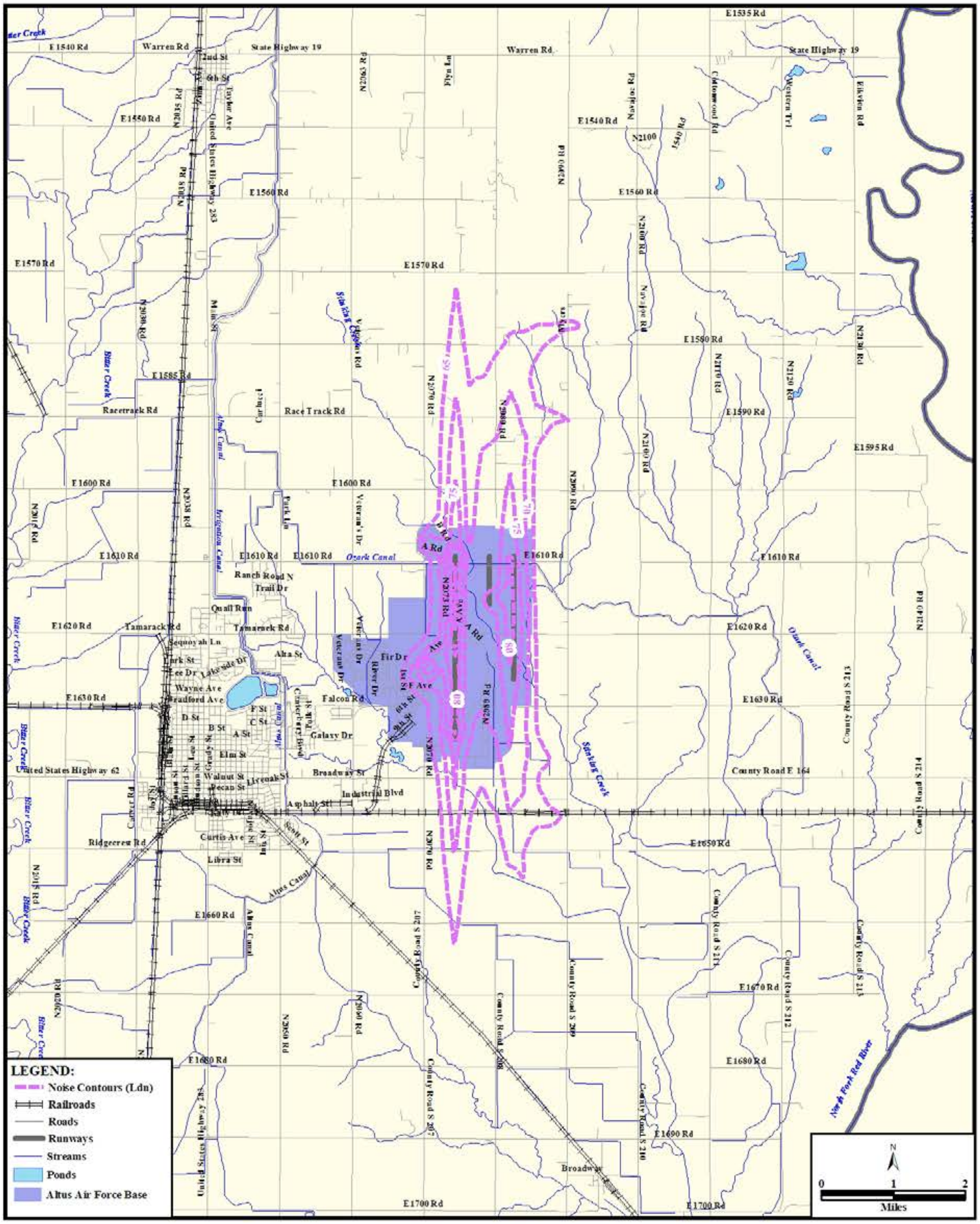


Figure 4-4 Noise Contours, End-State Condition, Alternative Action, Altus Air Force Base

4.3.1.3 No-Action Alternative

Under the no-action alternative, there would be no change from the baseline conditions described in Section 3.3.1.

4.3.1.4 Cumulative Impacts

Past, present, and reasonably foreseeable future proposals in the ROI have the potential to create noise impacts. For the projects identified, noise would result from construction activities and other modified or added aviation activities.

Noise on construction sites normally results from the use of heavy equipment and other vehicular movement. Demolition projects also have the potential to generate elevated noise levels from the same sources. Construction and demolition would occur as part of the development of the new Civil Engineering Complex, the privatization of military family housing, and the construction of a radar facility. Elevated noise levels resulting from construction and demolition are usually sporadic and transitory, are relatively confined to the immediate vicinity of the construction site, and, of course, cease at the completion of the project. Considering the usual levels of sound created by these activities in comparison to aviation-related noise in the same areas, there should not be a noticeable impact. While construction-related sound may be heard in close proximity to the project, it is not usually excessive and noise from aircraft operations would be expected to continue to dominate the acoustic character of the ROI.

There are two proposals that would increase aircraft-related noise in the region. The first includes the potential use of the ALZ by C-130 aircraft and the second would involve aviation activities at CSIA that would be specifically associated with its operation as a spaceport. Potential cumulative impacts at CSIA are discussed further in Section 4.5.1.4.

If C-130 aircraft began to train on the ALZ, noise levels could increase slightly, but such increases would not occur. Since noise associated with C-17 operations is greater than that which would be associated with C-130 operations, jet noise would most likely remain the dominant noise source.

Military Training Routes

Several of the MTRs assessed in this EA are opposite direction routes, following the same ground track, partially overlap with other routes, or intersect with other routes. Therefore, the cumulative noise exposure on the ground from these interactions is the sum of the noise levels on each individual route. These cumulative effects are shown in Table 4-10. Only the MTR is identified for routes that have the same noise levels along the entire route. For those routes with differing noise levels, the applicable segments are shown.

Table 4-10 Cumulative Noise Levels Along Military Training Routes

MTR Interaction	Noise Levels (in L_{dnmr})		
	Baseline	Proposed	Change
IR-154 + IR-155 (B-C)	32	45	13
IR-154 + IR-155 (I-K)	32	45	13
IR-154 + IR-155 (K-N)	33	46	13
VR-198 (B-C) + VR-199 (I-J)	28	44	16
VR-198 (A-B / C-K) + VR-199 (A-I / J-K)	31	47	16
VR-190 + VR-191	49	51	2
VR-190 + VR-191 + VR-198 (D-E) + VR-199 (G-H)	49	53	4
SR-216 + VR-190 + VR-191 + VR-198 (D-E) + VR-199 (G-H)	49	54	5
SR-216 + VR-190 + VR-191	49	52	3
SR-206 (A-B) + VR-190 + VR-191	49	52	3
SR-205 (B-E) + VR-190 + VR-191	49	52	3
SR-205 (B-E) + VR-144 (A-C / E-F) + VR-184 (A-B / D-F)	48	52	4
SR-206 (B-E) + SR-208 (A-B) + VR-190 + VR-191	49	53	4
SR-217 (D-F) + VR-190 + VR-191	52	54	2
SR-205 (B-E) + SR-216 + SR-217 (A-C) + VR-198 (A-B / C-K) + VR-199 (A-I / J-K)	49	54	5
SR-206 (B-E) + SR-208 (B-C)	33	49	16
VR-144 (A-C / E-F) + VR-184 (A-B / D-F) VR-190 + VR-191	52	54	2

Source: NOISEMAP

As shown, although the increase in sound levels appears large in some cases, it should be noted that the highest resultant cumulative sound level is L_{dnmr} 54. This is well below sound levels that would have the potential to impact any persons or existing land uses. MTR use results in minimal cumulative noise impacts.

4.3.1.5 Mitigative Actions

Mitigation would be necessary as overall noise levels in the vicinity of Altus AFB decrease under the proposed and alternative actions.

4.3.2 Air Quality

There are no established criteria for assessing the significance of impacts from mobile source emissions in attainment areas neither under NEPA regulations nor under local ODEQ regulations. Commonly, applicability thresholds from other federal, state, and local air pollution standards and regulations can be used to assess significance of a proposed action. The United States Environmental Protection Agency (USEPA) has developed guidelines to evaluate the impact from major new or modified sources in attainment areas, such as those air basins (or AQCR) surrounding Altus AFB and the other airfields, called Prevention of Significant Deterioration (PSD). The goal is to require that any proposed project resulting in emissions of 250 tpy or more of any criteria pollutant from stationary sources demonstrate, through detailed dispersion modeling, that the increase would not (a) increase ambient air pollution concentration above any NAAQS; (b) contribute to an existing violation of any NAAQS; (c) interfere with or

delay timely attainment of NAAQS; or (d) impair visibility within any federally mandated PSD Class I area. In addition, impacts to soil and vegetation are assessed in a formal PSD demonstration. The nearest PSD Class I area to the proposed sites is the Wichita Mountains Wilderness.

Therefore, for the purpose of this analysis, project emissions (mobile and stationary) would be considered potentially significant if they exceed the PSD major source threshold of 250 tpy for any pollutant in an attainment or unclassified area. If the emissions from the proposed action or alternative action exceed the PSD significance threshold described above, further analyses would be performed to assess whether there was a likelihood of a significant impact to air quality. Although the majority of emissions are the result of aircraft operations, the emissions are created at fairly low altitudes, and have the potential to remain below the ceiling level (on average 4000 feet above msl) and contribute to ground level concentrations of air pollutants of regional concern. It is important to note that the PSD permitting process will not apply to the proposed or alternative actions, as the net increase in emissions from permitted, stationary sources is not expected to exceed the applicability thresholds.

The approach to the air quality analysis was twofold. First, an emissions inventory was developed for the action to determine the magnitude of the increase in emissions. If predicted end-state emissions exceed the significance threshold, an air dispersion model was used to analyze the worst-case changes in ambient air concentrations resulting from the action. The Multiple-Aircraft Instantaneous Line Source (MAILS) dispersion model (Leibsch, 1992) was used to estimate air pollutant concentrations from a reasonable practical scenario for the AQCR where the highest emissions from the proposed action would occur. The MAILS model is an air quality-screening model that provides conservative estimates of ground-level pollutant concentrations resulting from aircraft engine emissions during flights and is intended for low-altitude flights (below 5,000 feet). Predicted concentrations from the MAILS modeling run are compared with the NAAQS concentration levels for the regulated pollutants. The level of increased emissions and the ground-level impacts were also used to qualitatively assess potential impairments to visibility in PSD Class I areas. Detailed air pollutant emission calculations are presented in Appendix C.

4.3.2.1 Proposed Action

The proposed action involves a redistribution of aircraft training activities utilizing 14 existing military training routes (MTR) and five airfields, Altus AFB, Sooner DZ, CSIA, Amarillo IAP, and Lubbock IAP. Implementation of the proposed action would result in emissions associated with construction and operational activities.

Construction Emissions

Construction activities produce short-term combustive and fugitive dust emissions, which would cease once construction is completed. Emissions from construction activities include exhaust emissions from heavy equipment (i.e., bulldozers, backhoes, etc.) and fugitive dust emissions from demolition and grading activities. Emissions from construction activities at Altus AFB under the proposed action are presented on Table 4-11.

Table 4-11 Estimated Emissions Associated with Construction Activities at Altus AFB, Proposed Action

Construction Activities (FY)	Annual Pollutant Emissions (Tons/Year)				
	CO	VOC	NO_x	SO_x	PM
Construction & Grading (FY 03)	**0.1**	**0.04**	**0.6**	**<0.1**	**0.04**
Construction & Grading (FY 04)	**0.1**	**0.03**	**0.5**	**<0.1**	**0.04**
Construction & Grading (FY 05)	**0.1**	**0.02**	**0.3**	**<0.1**	**0.02**
Construction & Grading (FY 06)	**0.3**	**0.1**	**1.2**	**<0.1**	**0.1**
Construction & Grading (FY 07)	**10.8**	**5.5**	**50.9**	**0.1**	**4.1**
Construction & Grading (FY 10)	**9.7**	**3.0**	**44.6**	**<0.1**	**3.3**

Operational Emissions

Operational emissions include direct and indirect project emissions. Direct emissions include emissions from stationary sources at Altus AFB such as ground support equipment (GSE), and emissions from aircraft operations. For the purpose of this analysis, it was assumed that the proposed action would not result in a net change in emissions from GSE as compared to baseline conditions. Emissions associated with fuel storage, loading & unloading, as well as potential spillage or other releases would also assumed to be the same as for baseline conditions. Indirect emissions include emissions from vehicles commuting to and from the base and consumption of fossil fuels to provide power, heating, and hot water. Although demolition and construction activities are planned to occur, increases in total inhabitable space requiring heating, power, and hot water are small as compared to the baseline conditions and occur over many years. Thus, indirect emissions from the increase in utility demand were not considered in these analyses.

Section 2.4.1 describes the changes in total flying hours for the C-17, C-5, and KC-135 aircraft, under the proposed action. This data defines the peak and end-state conditions, as FY 05 and FY 11, respectively. To assess the potential impact to air quality, emissions resulting from both of these operational levels should be estimated and compared to the baseline level to calculate the projected change in emissions. However, specific emission factors used to calculate air pollutant emissions have been established for landing and takeoffs, touch and gos, and military mode flying, and not based solely on flying hours. As stated above, only emissions from aircraft operations at low to mid level altitudes will be considered in these analyses. Thus, emissions were calculated for activity along the MTRs, as described in Section 2.4.2 Air Space and Training Locations, and for arrival/departure and closed pattern operations, as described in Section 2.4.3 Transition Training. Lastly these analyses present emissions from on-road vehicles due to student loads and manpower, as described in Section 2.4.4. Since the changes in operations includes modifying the location or pattern at which these emissions are generated, crossing over four AQCRs, it is important to assess the changes, both increases and decreases, to flight operations and the resulting emissions at the AQCR basis to determine potential significance. Therefore, summaries of emissions by location and AQCR are presented further below the project-level tables.

Projected emissions from aircraft activities were calculated using emission factors, flight profiles, and power settings for each aircraft from the available literature (Jagielski and O'Brien 1994; EPA 1992; USAF 2002a; USAF 2002b; Gunston 1995; Hewson 1996).

Airspace and Training Locations

A summary of the change in criteria air pollutant emissions from aircraft operations through all MTRs under the proposed action, compared to baseline conditions, is shown on Table 4-12. Emissions resulting from VR and SR routes are emitted at altitudes less than 3000 feet above msl. IR routes allow aircraft to fly up to 10,000 feet above msl, which is higher than the average maximum mixing heights reported for Oklahoma. Thus, it was assumed that half of the emissions from the IR routes will be emitted at lower altitudes, and may impact ground level concentrations of air pollutants. It should be noted that these emissions would be dispersed throughout an area more than 5,000 square miles over the course of the year. According to data from the USAF, the activities at the MTRs would not differ between FY 05 (peak condition) and FY 11 (end-state condition).

Table 4-12 Change in Aircraft Emissions in Military Training Routes by Airspace, Proposed Action

Airspace	AQCRs	Change in Aircraft Emissions (tons/year)				
		CO	VOC	NO_x	SO_x	PM
SR-205	**189, 210, 211**	0.5	0.0	9.4	0.5	0.6
SR-206	**189, 210, 211**	0.6	0.0	10.6	0.5	0.7
SR-208	**189, 210, 211**	0.7	0.0	12.4	0.6	0.8
SR-216	**189, 210, 211**	0.6	0.0	6.0	0.3	0.4
SR-217	**189, 210, 211**	3.2	0.2	229.5	11.4	15.5
VR-144	**189, 210, 211**	0.6	0.0	15.8	0.8	1.1
VR-184	**189, 210, 211**	2.0	0.1	141.5	7.0	9.5
VR-190	**189, 210, 211**	4.9	0.3	361.7	17.9	24.4
VR-191	**189, 210, 211**	1.2	0.1	47.8	2.4	3.2
VR-198	**187, 189, 210, 211**	1.0	0.0	21.0	1.1	1.4
VR-199	**187, 189, 210, 211**	1.0	0.0	21.0	1.1	1.4
IR-103	**189, 210, 211**	0.6	<0.1	34.2	1.7	2.3
IR-154	**210, 211**	0.5	0.0	12.8	0.6	0.8
IR-155	**210, 211**	0.4	0.0	0.2	0.0	0.0

Transition Training

Transition training consists of arrival/departure activities such as instrument approaches, landing and takeoffs, touch and gos, and closed pattern operations. The change in emissions resulting from operations at Altus AFB for the peak year and end-state conditions are presented in Table 4-13.

Table 4-13 Change in Aircraft Emissions from Peak Year and End Year Transition Training at Altus AFB, Proposed Action

Location	Annual Emissions Increase (Tons/Year)				
	CO	VOC	NO_x	SOx	PM_{10}
Altus AFB (Peak State)	-100.2	-6.5	-484.9	-47.3	-59.3
Altus AFB (End State)	-160.3	-27.5	-626.0	-55.5	-66.1

Indirect Emissions from Commuting Vehicles

Implementation of the proposed action would result in the addition of 459 instructors and contractor personnel at Altus AFB. It was assumed that students would live on base while in training. The resultant increase in commuting emissions due to vehicular travel by these new full-time employees to and from the base were calculated using emission factors from *Calculation Methods for Criteria Pollutant Emission Inventories* (Jagelski and O'Brien, 1994). All POVs were assumed to be light-duty, gasoline-powered vehicles with 1995 as the average vehicle model year. Annual criteria pollutant emissions from POVs commuting of 459 full-time employees, assuming an average round-trip commuting distance of 20 miles and a carpooling ratio of 1.1, are shown in Table 4-14.

Table 4-14 Change in Commuting Vehicle Emissions, Proposed Action, Altus Air Force Base

Emission Source	Change in Annual Emissions (Tons/Year)				
	CO	VOC	NO_x	SO_x	PM
Commuting POV	39.7	5.9	3.9	<0.1	0.2

This section provides the estimated change in air emissions associated with the implementation of the proposed action at Altus AFB. However, potential air quality impacts resulting from a proposed action must be considered for the entire AQCR. Altus AFB, Sooner DZ, CSIA, and portions of 12 of the 14 MTRs are all located in AQCR 189. Detailed calculations were performed to estimate the fraction of the total increase in emissions from the aircraft activities along those MTRs (see Table 4-12) that could potentially impact the air quality of AQCR 189. It was estimated that the entire increase in emissions from the additional commuting vehicles would occur within AQCR 189. Table 4-15 presents the total change in emissions for AQCR 189, under both the peak and end-state conditions for the proposed action. The location-specific emissions for Sooner DZ and CSIA are presented separately in Sections 4.4.2.1 and 4.5.2.1, respectively. Detailed air pollutant emission calculations are presented in Appendix C.

Table 4-15 Change in Total Operational Emissions for Air Quality Control Region 189, Proposed Action (Altus Air Force Base, Sooner Drop Zone Vicinity, Clinton-Sherman Industrial Airpark, and Military Training Routes)

AQCR	Change in Annual Emissions (tons/year)				
	CO	**VOC**	**NOx**	**SO_x**	**PM**
Peak Condition					
Aircraft Operations	-20.6	4.6	530.0	26.3	84.7
Vehicles	39.7	5.9	3.9	<0.1	0.2
Total AQCR 189	**19.1**	**10.5**	**533.9**	**26.4**	**84.9**
End-State Condition					
Aircraft Operations	-98.3	-20.6	145.3	-0.2	65.3
Vehicles	39.7	5.9	3.9	<0.1	0.2
Total AQCR 189	**-58.6**	**-14.7**	**149.2**	**-0.1**	**65.5**

As shown on Table 4-15, the increase in emissions of NO_x in the air basin surrounding Altus AFB, Sooner DZ, and the CSIA during the peak condition (FY 05) as compared to the baseline conditions would exceed the USEPA PSD criteria of 250 tpy. In addition, construction related emissions, although relatively minor compared to operational emissions, would also occur during FY 05. Increases for all other pollutants would remain below the threshold. In subsequent years, primarily driven by the reduction in C-5 aircraft operations, the increase in emissions for all pollutants of concern as compared to the baseline conditions would not exceed these criteria. Therefore, the changes in operations under the end-state condition of the proposed action are not predicted to cause an impact to air quality in AQCR 189.

Implementation of the proposed action is not predicted to have a long-term impact to the nearest PSD Class I area, the Wichita Mountains Wilderness. Determination of the impact of an activity on visibility in a PSD Class I area is typically associated with evaluation of stationary source contributions. Decreased visibility may potentially result from elevated concentrations of PM_{10} and SO_2 in the lower atmosphere. Construction activities at Altus AFB would generate low-level emissions, well below the PSD thresholds. The actual construction emissions are likely to be less than the estimated emissions (Table 4-16) due to implementation of additional control measures in concert with standard construction practices. For instance, frequent spraying of water on exposed soil during construction is a standard procedure that could be used to minimize the amount of dust generated during construction. Therefore, combustive and fugitive dust emissions would produce localized, short-term elevated air pollutant concentrations, which would not have a long-term impact to the visibility of the Wichita Mountains Wilderness.

Table 4-16 Change in Total Operational Emissions, Proposed Action, Air Quality Control Regions 187 and 210

AQCR	Change in Annual Emissions (tons/year)				
	CO	VOC	NOx	SO_x	PM
Peak Condition					
187	0.2	0.0	4.4	0.2	0.3
210	3.8	0.2	227.1	11.3	15.3
End-State Condition					
187	0.2	0.0	4.4	0.2	0.3
210	3.8	0.2	227.1	11.3	15.3

Altus AFB will be responsible for operating sources in compliance with local, state, and federal air quality regulations, including limits and conditions contained within the operating permit. In addition, Altus AFB is responsible for obtaining any modifications or additions to their synthetic minor operating permit in a timely manner, as prescribed by the ODEQ. Because implementation of the proposed action is not expected to increase total emissions from stationary permitted sources, it is unlikely that the proposed action would result in Altus AFB becoming a major source under Title V permitting.

Portions of all MTRs are located within the boundaries of AQCRs 187 and 210. Detailed calculations were performed to estimate the fraction of the total increase in emissions from the aircraft activities along those MTRs (see Table 4-12) that could potentially impact the air quality of AQCRs 187 and 210. There are no airfields within these AQCRs, and no increase in manpower loading would occur. Table 4-16 presents the total change in emissions for AQCRs 187 and 210, under both the peak and end-state conditions.

As shown on Table 4-16, the increase in emissions of all pollutants of concern in the air basins surrounding AQCRs 187 and 210 during both the peak and end-state conditions would not exceed the USEPA PSD criteria of 250 tpy. Therefore, the changes in operations under the proposed project are not predicted to impact air quality in AQCRs 187 and 210.

4.3.2.2 Alternative Action

The alternative action involves the redistribution of aircraft activities at five different locations (Altus AFB, Sooner DZ, CSIA, Amarillo IAP, and Lubbock IAP) and the 14 MTRs. Additionally under the alternative action, the Air Force would construct an ALZ airstrip at one of four potential locations. Two of the potential ALZ sites are located near the Sooner DZ and two are located at CSIA. All four of the potential sites are located in AQCR 189. Implementation of the alternative action would result in emissions associated with construction and operational activities.

Construction Emissions

Emissions from construction activities under the alternative action were calculated based on the same emission data and assumptions provided under the proposed action. Emissions from construction activities at Altus AFB for the alternative action are presented on Table 4-17.

Table 4-17 Estimated Emissions Associated with Construction Activities, Alternative Action, Altus Air Force Base

Construction Activities (FY)	Annual Pollutant Emissions (Tons/Year)				
	CO	VOC	NO_x	SO_x	PM
Construction & Grading (FY 03)	**0.1**	**0.04**	**0.6**	**<0.1**	**0.04**
Construction & Grading (FY 04)	**0.1**	**0.03**	**0.5**	**<0.1**	**0.04**
Construction & Grading (FY 05)	**0.1**	**0.02**	**0.3**	**<0.1**	**10.6**
Construction & Grading (FY 06)	**0.3**	**0.1**	**1.2**	**<0.1**	**0.1**
Construction & Grading (FY 07)	**10.8**	**5.5**	**50.9**	**0.1**	**4.3**
Construction & Grading (FY 10)	**9.7**	**3.0**	**44.6**	**<0.1**	**3.3**

Operational Emissions

Operational emissions include direct and indirect project emissions. Similar to the discussion presented under the proposed action, emissions from commuting vehicles is the only indirect operational emissions predicted to change from the baseline conditions. Emissions from aircraft operations and indirect emissions from commuting vehicles were calculated based on the same emission data and assumptions provided under the proposed action.

To assess air quality impacts to the air basin surrounding Altus AFB resulting from the implementation of the alternative action, changes in emissions within AQCR 189 from all sources at each airfield and MTR must be considered. A summary of the change in criteria air pollutant emissions for AQCR 189 under both the peak and end-state conditions for the alternative action is shown on Table 4-18. The location-specific emissions for Sooner DZ and CSIA are presented separately in Sections 4.4.2.2 and 4.5.2.2, respectively.

Table 4-18 Change in Total Operational Emissions for Air Quality Control Region 189, Alternative Action (Altus Air Force Base, Sooner Drop Zone Vicinity, Clinton-Sherman Industrial Airpark, and Military Training Routes)

AQCR	Change in Annual Emissions (tons/year)				
	CO	**VOC**	**NOx**	**SO_x**	**PM**
Peak Condition					
Aircraft Operations	-80.6	-15.7	396.1	18.3	0.2
Vehicles	40.5	6.0	4.0	<0.1	0.2
Total AQCR 189	**-40.1**	**-9.7**	**400.1**	**18.4**	**0.4**
End-State Condition					
Aircraft Operations	-100.3	-29.2	-63.9	-1.0	-15.2
Vehicles	40.5	6.0	4.0	<0.1	0.2
Total AQCR 189	**-59.8**	**-23.2**	**-59.9**	**-10.9**	**-15.0**

As shown on Table 4-18, the increase in emissions of NO_x in the air basin surrounding Altus AFB, Sooner DZ, and the CSIA during the peak condition (FY 05) as compared to the baseline conditions would exceed the USEPA PSD criteria of 250 tpy. Increases for all other pollutants would remain below the threshold. However, in the end-state condition, the increase in emissions for all pollutants of concern as compared to the baseline conditions would not exceed these criteria. Therefore, the changes in operations under the end year of the alternative action are not predicted to impact air quality in AQCR 189.

Implementation of the proposed action is not predicted to have a long-term impact to the nearest PSD Class I area, the Wichita Mountains Wilderness. As described in Section 4.3.2.1 for the proposed action, determination of the significance of an activity on visibility in a PSD Class I area is typically associated with evaluation of stationary source contributions. Decreased visibility may potentially result from elevated concentrations of PM_{10} and SO_2 in the lower atmosphere. Combustive and fugitive dust emissions from construction activities at Altus AFB under the alternative action would produce localized, short-term elevated air pollutant concentrations, which would not have a long-term impact to the visibility of the Wichita Mountains Wilderness.

Portions of all MTRs are located within the boundaries of AQCRs 187 and 210. Table 4-19 presents the total change in emissions for AQCRs 187 and 210, under both the peak and end-state conditions for the alternative action.

Table 4-19 Change in Total Operational Emissions, Alternative Action, Air Quality Control Regions 187 and 210

AQCR	Change in Annual Emissions (tons/year)				
	CO	VOC	NOx	SO_x	PM
Peak Condition					
187	0.2	0.0	4.4	0.2	0.3
210	5.0	0.3	315.9	15.7	21.3
End-State Condition					
187	0.2	0.0	4.4	0.2	0.3
210	5.0	0.3	315.9	15.7	21.3

Table 4-19 presents the predicted increases in emissions of all pollutants of concern in the air basins surrounding AQCR 187 during both the peak and end-state conditions. The increases would not exceed the USEPA PSD criteria of 250 tpy. Therefore, the changes in operations under the alternative action are not predicted to impact air quality in AQCR 187.

The increases in emissions within AQCR 210 are also shown on Table 4-19. During both the peak and end-state conditions the increase in NO_x emissions would exceed the USEPA PSD criteria of 250 tpy. Increases for all other pollutants would remain below the threshold. Therefore, to determine any potential impacts to ground level concentrations of NO_x, the MAILS dispersion model (Leibsch 1992) was used to estimate NO_2 concentrations from MTR (*i.e.*, SR, IR, and VR) sorties conducted under the alternative action (end-state condition) by C-17, T-1, and T-38 aircraft within AQCR 210. Projected annual sorties within the AQCR were based on the total annual sorties within each MTR and the proportion of each MTR above each AQCR. To simplify the MAILS model, it was assumed that all sorties are conducted at 500 feet AGL. This is a conservative assumption since, in some cases, the sorties occur at altitudes significantly greater than 500 feet AGL (*i.e.*, the lower modeled altitude would lead to potentially higher ground-level ambient concentrations, thus exaggerating the projected impact). It was also conservatively assumed, for the purposes of modeling, that all sorties in AQCR 210 would occur over the same path, rather than over a 10-county region in Texas spanning thousands of square miles of area and thousands of vertical feet of altitude. Thus, if the analysis did not result in impacts, using such conservative assumptions, it could be concluded that the alternative action would not result in adverse air quality impacts.

The aircraft emissions database in the MAILS model was modified by adding revised emission factor data for the aircraft engines operating in military mode. For the purpose of this analysis, a mixing height of 3,000 feet was chosen. The annual ground-level concentrations of NO_2 predicted by the MAILS model were compared against Federal PSD Class I increments and the NAAQS, shown in Table 4-20. The modeling run verified that air impacts of the alternative action would not occur.

Table 4-20 Modeling Predictions of Nitrogen Dioxide Concentrations Resulting from Military Training Route Sorties, Air Quality Control Region 210

Criteria Pollutant	Averaging Period	Concentration (μg/m^3)			Impacts (%)	
		NAAQS	PSD Class I Increment	Affected Airspace	Percentage of NAAQS	Percentage of PSD Class I Increment
NO_2	Annual	100	2.5	0.13	0.13 %	5.2 %

Source: Leibsch, 1992

4.3.2.3 No-Action Alternative

Under the no-action alternative, the baseline operating conditions, and the resultant levels of air pollutant emissions, would continue. Therefore the air quality, as described in Section 3.1.3.3, would not be impacted by this alternative.

4.3.2.4 Cumulative Impacts

Analysis of the potential impacts from other proposed actions affecting the ROI have been or are currently being analyzed in separate NEPA documents. These actions are not directly related to the proposed and alternative actions evaluated in this EA, but are additional actions identified by the installation.

Additional construction related emissions occurring at Altus AFB would further add to the net increase in emissions within AQCR 189. However, the projects discussed in Section 2.7 would not result in an appreciable net increase in occupied space or manpower loading. Thus, operations resulting from the proposed cumulative projects would not result in an increase in direct or indirect emissions. Since the increase in emissions under both the proposed and alternative actions for the end-state condition, FY 11, falls below the USEPA PSD criteria of 250 tpy, it is not expected that there would be long-term cumulative impacts to air quality in the region.

4.3.2.5 Mitigative Actions

Mitigation measures to protect human health and welfare would not be required, since the implementation of the proposed and alternative actions would not result in impacts to regional air quality.

4.3.3 Earth Resources

In evaluating impacts on earth resources, several items were examined, including: 1) the degree to which the proposed action and alternatives could potentially disrupt the ground surface and destroy the soil profile through excavation and removal of rock and soil in the construction of facilities; 2) the degree to which the proposed action and alternatives could potentially increase erosion caused by the disturbance of the ground surface during the construction of

facilities; and 3) the degree to which the proposed action and alternative eliminates prime farmland.

4.3.3.1 Proposed Action

The proposed construction projects at Altus AFB would require soil disturbances of about 11 acres. The construction projects would be located in previously disturbed areas and would slightly increase soil erosion during the construction phase. However, impacts to earth resources would be minimized by use of standard engineering practices (e.g., application of water for dust control) that reduce erosion. In addition, prime farmlands are not located within the proposed project areas. Therefore, impacts to earth resources under the proposed action would not occur.

4.3.3.2 Alternative Action

Impacts at Altus AFB from implementation of the alternative action would be the same as described for the proposed action (Section 4.3.3.1).

4.3.3.3 No-Action Alternative

Under the no-action alternative, soil disturbances would not occur. Therefore, there would be no change from the baseline conditions described in Section 3.1.4.

4.3.3.4 Cumulative Impacts

Construction of facilities under the proposed and alternative actions, Base Civil Engineer Complex, MFH privatization, and DASR system would involve modification of surface features. Potential cumulative impacts to soils would include increased soil erosion during the construction periods. Impacts associated with MFH privatization and the DASR system are being analyzed in separate NEPA documents, being prepared concurrently with this effort. However, as impacts are not anticipated with each project, cumulative effects are not expected. Any effects will be minimized due to use of standard engineering practices (e.g., application of water for dust control). Prime farmlands are not located at any of the project areas.

4.3.3.5 Mitigative Actions

Only minor soil erosion from wind and storm water runoff would be expected during construction activities. Accepted containment procedures, including adequate watering, would be implemented during the construction phases to minimize sediment runoff from the disturbed area. Therefore, given the current conditions and the proposed plans and actions, no mitigation measures are required.

4.3.4 Water Resources

Evaluating the impacts on water resources involved consideration of several items, including: 1) the degree to which the proposed action and alternatives change impermeable surface areas; 2) the degree to which the proposed action and alternatives degrade surface water quality; and 3) the degree to which the potential decline in groundwater levels results in a substantial depletion of water resources.

4.3.4.1 Surface Water

4.3.4.1.1 Proposed Action

The proposed construction projects are expected to increase impervious surface cover by 11.17 acres on Altus AFB. Compared to the 713 acres of impervious cover on Altus AFB (calculated from base maps), this is expected to have a minimal increase on the total amount of impervious cover (1.6 percent) and on the total volume of storm water runoff or on surface water quality. Therefore, no impacts to surface water are expected.

4.3.4.1.2 Alternative Action

Impacts at Altus AFB from implementation of the alternative action would be the same as described for the proposed action (Section 4.3.4.1.1).

4.3.4.1.3 No-Action Alternative

Under the no-action alternative, there would be no change from the baseline conditions described in Section 3.1.5.1.

4.3.4.1.4 Cumulative Impacts

Construction of facilities under the proposed and alternative actions, Base Civil Engineer Complex, MFH privatization, and DASR system are expected to cumulatively increase impervious surface cover at Altus AFB. These are expected to have a minimal impact on the total amount of impervious cover and on the total volume of storm water runoff or on surface water quality. Therefore, the net cumulative effect on storm water due to the proposed activities would be minimal when compared to the whole installation and no cumulative impacts are expected. Table 4-21 provides detail regarding the potential changes to impervious cover from the proposed action and Base Civil Engineer Complex. Impacts associated with MFH privatization and the DASR system are being analyzed in separate NEPA documents, being prepared concurrently with this effort.

Table 4-21 Summary of Impervious Cover Impacts, Cumulative Actions

Project	Surface Cover (acres)
C-17 Facilities	11.17
Base CE Complex	0.9
TOTAL:	**12.07**

4.3.4.1.5 Mitigative Actions

Mitigation measures would not be required for the proposed action. Impacts on water resources from the proposed action are minimal when compared to the whole installation.

4.3.4.2 Groundwater

4.3.4.2.1 Proposed Action

Only shallow excavation would be required for the construction of facilities at Altus AFB. Accordingly, there would be no effect on groundwater from implementation of the proposed action.

4.3.4.2.2 Alternative Action

Impacts to groundwater under this alternative would be the same as those described in Section 4.3.4.2.1.

4.3.4.2.3 No-Action Alternative

Under the no-action alternative, there would be no change from the baseline conditions described in Section 3.1.5.2.

4.3.4.2.4 Cumulative Impacts

No effect on groundwater associated with the proposed action or the proposed projects at Altus AFB is anticipated; therefore, there would be no cumulative impacts.

4.3.4.2.5 Mitigative Actions

Mitigation measures to protect health and welfare would not be required for the proposed action.

4.3.5 Hazardous Materials and Wastes

The evaluation of impacts on hazardous materials included the assessment of the degree to which proposed construction activities could effect the existing environment.

4.3.5.1 Proposed Action

Hazardous materials used for the proposed construction of facilities would be limited to those typical to a construction environment (e.g., fluids and fuels for construction equipment, asphalt ingredients, paints, etc.). The typical use of these materials in accordance with instructions and applicable regulations is not likely to create environmental release. Hazardous materials used during the project would be managed by the agency or contractor performing the construction activities per the laws, regulations, and plans identified in Section 3.1.6.1.

Hazardous material consumption associated with the maintenance of additional C-17 aircraft would be increased under the proposed action. The additional hazardous materials would be managed in accordance with existing plans and procedures established by Altus AFB.

Hazardous wastes are not expected to be generated as a result of the construction projects. The hazardous materials described above are typically consumed in process and would therefore not create waste as an end product. If generated, hazardous wastes from the construction

activities would be managed in accordance with applicable regulations (Section 3.1.6.2) by the contractor generating the waste.

Hazardous wastes would be generated by maintenance activities performed on the additional C-17 aircraft. As Altus AFB is currently regulated as a Large Quantity Generator, the increased hazardous waste generation would not result in additional regulatory requirements by either the USEPA or the State of Oklahoma, Department of Environmental Quality. Therefore, impacts to hazardous waste would not occur.

The proposed facilities are not located in the vicinity of IRP sites; therefore, no impacts are expected.

Asbestos and lead-based paint is not expected to be generated by the proposed renovation projects. If asbestos or lead-based paint materials are encountered, they will be managed by the contractor in accordance with the laws, regulations, and plans identified in Section 3.1.6.4.

4.3.5.2 Alternative Action

Impacts to hazardous materials and wastes under this alternative would be the same as those described in Section 4.3.5.1.

4.3.5.3 No-Action Alternative

Under the no-action alternative, there would be no change in the management of hazardous materials as described in Section 3.1.6.

4.3.5.4 Cumulative Impacts

Hazardous materials and wastes are not expected to be impacted as a result of the proposed actions. IRP sites would not be cumulatively impacted under the proposed actions. In addition, asbestos and lead-based paint would not experience cumulative impacts.

4.3.5.5 Mitigative Actions

Spills of liquid products such as fuels, oils, and cleaning solvents should be managed according to the existing installation spill response plans. These documents implement applicable state and federal laws for management of these substances.

4.3.6 Biological Resources

Potential impacts to biological resources are determined by analyzing the proposed action and alternatives within the context of existing conditions for regional biota and ecosystems. An impact to biological resources would be considered if the proposed action or alternatives would have an adverse impact on threatened or endangered species, substantially diminish habitat for a plant or animal species, substantially diminish a regionally or locally important plant or animal species, interfere substantially with wildlife movement or reproductive behavior, or result in a substantial infusion of exotic plant or animal species.

4.3.6.1 Proposed Action

4.3.6.1.1 Vegetation and Wildlife

Vegetation. Approximately eight acres of previously disturbed land within the developed areas of the base would be used for construction. Because the eight acres is within the developed areas of the base, implementation of the proposed action would not impact the vegetation of Altus AFB.

Wildlife. Flight activities that create noise are not considered part of the natural habitats of most wildlife species. Noise associated with aircraft operations induces responses from some species, including potential behavioral changes, potential interference with mating, and potential changes in species ability to obtain food, water and shelter (USAF 2002a). The level of response is influenced by time of day, frequency of occurrences, reproductive status, sensitivity of species, and the species previous exposure to aircraft noise. The effects of aircraft noise on the reproductive capabilities of wildlife species is considered a major concern due to the potential to cause long term reductions in wildlife populations.

In general, wildlife repeatedly exposed to aircraft overflights become partially accustomed to aircraft noise, and their behavioral responses may diminish over time. Individual occurrences of reproductive failure may occur but are not expected to have a major impact on species reproduction and survival. The reduction in aircraft activity would lower the potential for aberrations in wildlife behavior and provide a less stressful noise environment for wildlife habitat than under current conditions. The elevated noise levels may have a minimal effect on wildlife where existing aircraft activity currently exists. There is currently no adequate information on the effects of low-altitude aircraft noise on wildlife to determine how individual species would respond.

Implementation of the proposed action at Altus AFB would result in a net decrease of elevated noise levels. Although it is not possible to quantify the amount of land in this area currently serving as habitat for wildlife, some of the wildlife near Altus AFB would benefit from the decrease of elevated noise levels associated with the implementation of the proposed action. In addition, implementation of the proposed action would result in the development of approximately 11 acres of land on Altus AFB. Because this area does not provide habitat for wildlife, this development is not anticipated to cause any adverse impacts to wildlife species.

Bird-aircraft strikes are considered a flight safety issue related to migratory and resident birds. Based on historical bird aircraft strike data provided by 97 AMW personnel, the potential for bird/aircraft strikes at Altus AFB is relatively low. Few bird/aircraft strikes have occurred during the past several years (USAF 2002a).

Many wildlife and bird species in the study area congregate near water. The Red River is an especially important habitat area for many species including several endangered bird species. To lessen the potential effects on these species from both a noise perspective and an aircraft strike potential, all flights over the Red River would be conducted at 800 feet AGL and no flights would occur at sunset.

In addition to noise sensitivity, some bird species may be at risk due to the potential for direct, physical contact with aircraft. Waterfowl, geese, cranes, and some raptors migrate at low-altitudes through the study area and have stopover sites along the North Fork Red Rover. Salt Fork Red River and Elm Fork Red River. The ODWC recommends limiting flight in these areas during spring and fall migrations (early March to early May and late September to late November) and during early evening and early morning hours when migrating birds are most active.

As part of this project, no proposed MTRs would occur directly over the Sandy Sanders Wildlife Management Area. Flight operations over the Black Kettle Wildlife Management Area (National Grasslands) would occur at 2,000 feet AGL. Additionally, impacts to the Reed Bat caves not anticipated because flight altitudes over this area would occur at 1,200 feet AGL at night and 1,000 feet AGL during the day. These procedures would eliminate the potential for impacts to the many Mexican free-tailed bats that inhabit this area. Noise sensitive areas are not located in the vicinity of the proposed extension of VR-144.

4.3.6.1.2 Threatened and Endangered Species

No state or federal records indicate that threatened or endangered species occur on or near Altus AFB. Two federally listed endangered species are known to exist in Jackson County, the interior least tern and the whooping crane. However, there are no records of either of these species occurring on or near the base. Although bald eagles migrate through areas near Altus AFB, no areas on Altus AFB provide habitat for bald eagles (USAF 2002a). The airspace utilized by aircraft performing aerial drop training from Altus AFB has been assessed in regard to bird/aircraft strike hazards. The analysis concluded that only moderate to occasional bird activity exists in the vicinity of Altus AFB.

The interior least tern is known to nest in Oklahoma during summer months, using sandbars along major rivers and around reservoirs. Interior least terns are capable of habituating to noise near the nest site but do not tolerate intrusions within the nesting colony. Flight paths crossing rivers where the interior least tern nests would be almost perpendicular to the flow of the river, ensuring that only a small area of each river is over flown per aircraft circuit. The active territorial defense radius for interior least tern nesting areas is approximately 300 feet. All aircraft overfly the Red River at 800 feet AGL. This current operating procedure minimizes any potential impact to nesting interior least terns. In addition, no flights occur over the Red River at sunset and all night flights are flown at a standard altitude of 500 feet AGL, except over areas of the Red River where the 800 feet AGL is maintained.

The whooping crane is known to migrate through the state during spring and fall, using prairie wetland areas and major rivers as stopover sites. Observations of whooping crane behavior in association with overflying aircraft indicate that the species is distrustful of aircraft and fears attack from above. However, in areas of low-altitude, sparse aircraft activity, this species can become habituated to the presence of aircraft. The major threat to whooping cranes is from the collision with aircraft. Whooping cranes migrate through the area at elevations ranging from 2,000 to 2,500 feet AGL and could use the Red River floodplain as a staging area.

Since these altitudes are well above the flight level of the aircraft that use the existing MTRs located in this area of the Red River, the chances of a whooping crane/aircraft collision would be minimal.

Since whooping cranes are transitory through the area, habitat or reproduction would not be affected. As with the interior least terns, all flights over the Red River would maintain the 800 feet AGL altitude and no flights over the Red River would occur at sunset. In addition, all pilots would be alerted to the possible occurrence of migrating whooping cranes, especially during peak migration times.

The bald eagle, listed as threatened, is the only other federally protected southwestern Oklahoma species. Bald eagles have been recorded in this part of the state during the winter, although not in Jackson or Washita Counties. No areas on Altus AFB provide habitat for bald eagles (USAF 2002a). In addition, there are no known rare species or communities, refuges, management areas, nature preserves, or registry natural areas within one mile of the base.

Bald Eagle nesting could occur along areas of the Red River. Since all operations over the Red River would occur at 800 feet AGL, the USFWS determined that effects on wintering bald eagles would not occur (USAF 2002a).

4.3.6.1.3 Wetlands

Although approximately 11 acres of land on Altus AFB would be developed, the proposed facilities are not located on or near wetland areas. Therefore, no wetland areas would be impacted with the implementation of the proposed action.

4.3.6.1.4 Floodplains

The construction activities proposed at Altus AFB would not occur in floodplains. Therefore, there would be no change from baseline conditions as described in Section 3.1.7.5.

4.3.6.2 Alternative Action

4.3.6.2.1 Vegetation and Wildlife

Impacts to vegetation and wildlife resulting from the implementation of the alternative action at Altus AFB would be the same as those resulting from the proposed action (Section 4.3.6.1.1).

4.3.6.2.2 Endangered and Threatened Species

Impacts to protected species associated with implementation of the alternative action at Altus AFB would be the same as described in 4.3.6.1.2.

4.3.6.2.3 Wetlands

Construction activities would not occur in wetland areas. Therefore, no impacts to wetlands are anticipated from the implementation of the alternative action at Altus AFB.

4.3.6.2.4 Floodplains

Construction activities would not occur in floodplain areas. Therefore, no impacts to floodplains are anticipated from the implementation of the alternative action at Altus AFB.

4.3.6.3 No-Action Alternative

The construction activities would not take place. Therefore, no impacts to biological resources on Altus AFB would occur under the no-action alternative.

4.3.6.4 Cumulative Impacts

Impacts to biological resources would not occur under the ongoing actions associated with the construction of facilities under the proposed and alternative actions, Base Civil Engineer Complex, MFH privatization, and DASR system. Therefore, cumulative impacts to biological resources at Altus AFB are not expected.

4.3.6.5 Mitigative Actions

As no construction of facilities would occur outside the previously disturbed developed area, impact to biological resources would not occur. Therefore, no mitigation measures beyond best management construction practices are required.

4.3.7 Cultural Resources

Cultural resources are subject to review under both federal and state laws and regulations. Section 106 of the NHPA of 1966 empowers the Advisory Council on Historic Preservation to comment on federally initiated, licensed, or permitted projects affecting cultural sites listed or eligible for inclusion on the NRHP. Eligibility evaluation is the process by which resources are assessed relative to NRHP eligibility criteria for scientific or historic research, for the general public, and for traditional cultural groups. Those cultural resources determined to be eligible are protected under the NHPA.

Analysis of potential impacts to cultural resources considers both direct and indirect impacts. Direct impacts may occur by physically altering, damaging, or destroying all or part of a eligibility; introducing visual or audible elements that are out of character with the property or alter its setting; or neglecting the resource to the extent that it deteriorates or is destroyed. Direct impacts can be assessed by identifying the types and locations of proposed activities and determining the exact location of cultural resources that could be affected. Indirect impacts result primarily from the effects of project-induced population increases.

4.3.7.1 Proposed Action

Under the proposed action, the facilities scheduled for renovation have not been identified as listed or eligible historic resources. In addition, these facilities have not been identified as Cold War properties. Therefore, the proposed action would have no adverse effect on known historic properties. Therefore, consultation with the Oklahoma SHPO for projects on Altus AFB would not be required.

There are no known, intact prehistoric or historic archaeological sites located in the areas of proposed demolition or construction activities. Therefore, the proposed action would not result in an adverse effect and there would be no impacts to archaeological resources. Although archaeological resources are not expected, if cultural resources are encountered during the proposed action, consultation with the Oklahoma Archeological Survey would be conducted by Altus AFB.

Given the nature of the MTRs as aircraft training routes several hundred feet above the ground, there would be no direct impacts on cultural resources associated with the existing and new MTRs. Indirect impacts on cultural resources resulting from the proposed action would include noise and visual intrusions. However, these indirect impacts would be limited due to the relatively brief duration of aircraft activity over any given area. Therefore, there would be no impact to any cultural resources in the vicinity of the MTRs as a result of the proposed action.

4.3.7.2 Alternative Action

Impacts to cultural resources under the implementation of the alternative action would be the same as described for the proposed action (Section 4.3.7.1.1).

4.3.7.3 No-Action Alternative

Under the no-action alternative, there would be no construction projects; therefore, there would be no effect on cultural resources as described in Section 3.1.8.

4.3.7.4 Cumulative Impacts

Cultural resources are generally distinct, and the effects of the proposed actions would not be additive. Therefore, there would be no cumulative effects.

4.3.7.5 Mitigative Actions

If unknown and unexpected archaeological resources are encountered during construction, construction would be halted and specific mitigation would be defined in consultation with the SHPO and the ACHP, and would be detailed in a Memorandum of Agreement, if applicable, initiated by the Air Force.

In accordance with NHPA, if during the course of program activities, cultural/historical materials (particularly human remains) are unexpectedly discovered, work in the immediate vicinity of the cultural materials shall be halted and the Oklahoma SHPO consulted through the Altus AFB Environmental Office. Subsequent actions would follow guidance provided in 36 CFR 800.11 and in the NAGPRA.

4.3.8 Infrastructure and Utilities

In evaluating impacts on infrastructure/utilities, several items were examined, including: 1) the degree to which a utility service would have to alter operating practices and personnel requirements; 2) the degree to which the change in demands from implementation of the proposed action and alternatives would impact system's capacity, 3) the degree to which a

transportation system would have to alter operating practices and personnel requirements to support the action; 4) the capacity required from new or revised transportation systems; 5) the degree to which the increased demands from the proposed program would reduce the reliability of transportation systems, or aggravate already existing adverse conditions on base; and 6) the degree to which the proposed action and alternatives change surface water runoff characteristics and erosion characteristics. For the evaluation of potential impacts, the ROI for the infrastructure/utilities resource area encompasses Altus AFB.

4.3.8.1 Stormwater Drainage

4.3.8.1.1 Proposed Action

Under the proposed action, several facilities would be constructed, or additions to existing facilities would be made at Altus AFB. As detailed in Table 4-22, a total of 466,570 sf, or 11.17 acres or impervious cover would be added to the installation. This is expected to have a minimal impact on the total amount of impervious cover (1.57 percent) and on the total volume of storm water runoff and would not impact existing storm water drainage systems.

Construction activities disturbing less than one acre that are not part of a larger plan do not require permitting. If the construction activity disturbs between one and five acres, a stormwater discharge permit for small construction activities would be required. Permitting for small construction activities is a relatively new regulation that appeared in Phase II (08 December 1998) of the national stormwater program. Construction activities requiring a stormwater permit would require the Air Force to develop a Storm Water Pollution Prevention Plan (SWPPP), perform an endangered species act certification process, complete and submit a Notice of Intent (NOI) form to apply for permit coverage, implement the SWPPP, and submit a Notice of Termination (NOT) to discontinue coverage if final stabilization has been achieved at the site.

Table 4-22 Summary of Impervious Cover Impacts, Proposed Action

Project	Surface Cover (acres)
Transportation Maintenance Bay Extension	0.01
Expand Flight Kitchen	0.04
Sheet Metal Fabrication Building	0.12
Add/Alter KC-135 AMU	0.16
Construct Visitors Quarters	1.49
Construct Fuels Complex	0.17
Construct Air/Land Operations Storage and Parking	3.21
Construct Single Bay Hangar and AMU	4.25
Construct AMU	1.72
TOTAL:	**11.17**

Source: Calculated from project descriptions.

4.3.8.1.2 Alternative Action

Impacts at Altus AFB from implementation of the alternative action would be the same as described for the proposed action (Section 4.3.9.1.1).

4.3.8.1.3 No-Action Alternative

Under the no-action alternative, there would be no change from baseline conditions as described in Section 3.1.9.1.

4.3.8.1.4 Cumulative Impacts

Overall, construction of facilities under the proposed and alternative actions, Base Civil Engineer Complex, MFH privatization, and DASR system are expected to cumulatively increase impervious surface cover within the ROI. However, minimal impacts on the total amount of impervious cover and on the total volume of storm water runoff are expected. Impacts associated with MFH privatization and the DASR system are being analyzed in separate NEPA documents, being prepared concurrently with this effort. The cumulative increases are not expected to impact exiting storm water drainage systems; therefore, no cumulative impacts are expected.

4.3.8.1.5 Mitigative Actions

The ground surface areas at Altus AFB are level, and only minor erosion from storm water runoff would be expected. Accepted containment procedures would be implemented during the construction phases to minimize sediment runoff from the disturbed areas; therefore, no mitigation measures are required.

4.3.8.2 Solid Waste Management

In considering the basis for evaluating solid waste impacts, several items were considered. These items include evaluating the degree to which proposed construction, changes in operations, and the potential for generating additional waste could effect the existing solid waste management program and capacity of the area landfills. The solid waste generated during the construction and demolition phases of the project would consist of building materials such as solid pieces of concrete, metals (conduit, piping, wiring), and lumber.

The analysis presented in this section incorporates the following assumptions:

- The approximate rate of solid waste generation from construction and addition debris is 4.25 pounds per ft^2 (Murphy and Chatterjee 1976).
- The approximate rate of solid waste generation for construction of brick and concrete structures is 3.0 cubic feet per square foot (Murphy and Chatterjee 1976);
- The approximate rate of solid waste generation from interior construction and alteration debris is 7 pounds per ft^2 (Murphy and Chatterjee, 1976).

- The approximate weight of asphaltic concrete is 120 pounds per cubic foot (lb/ft^3) (Merritt 1976);
- The weight of concrete debris is 150 lb/ft^3 (Merritt 1976); and
- The approximate rate of solid waste generation per person is 3.0 pounds per day (Murphy and Chatterjee 1976).
- The approximate rate of solid waste generation per student is 1.5 pounds per day (Murphy and Chatterjee 1976).

4.3.8.2.1 Proposed Action

Solid waste generation would increase as a result of the implementation of the proposed action. Solid waste would be generated from the construction of new facilities and additions to existing facilities at Altus AFB. In addition, Altus AFB would experience an increase of permanently assigned personnel and students to support the additional C-17 aircraft. Solid waste generated from the construction and addition projects would be approximately 766 tons, or about 1.7 percent of the annual quantity of solid waste received at the Altus Landfill (43,800 tons). The one-time generation of solid waste would decrease the life of the landfill by approximately 2 percent.

There would be a daily net increase of permanent party personnel and students associated with the proposed action. Based on the listed assumptions, and assuming about 500 permanent party personnel and approximately 500 students (both slightly higher than projected in Section 2.4.4), the proposed action would generate an estimated 169.4 tpy and 83.3 tpy for permanent party personnel and students, respectively. Therefore, an additional 252.7 tons of solid waste would be deposited in the Altus Landfill annually as a result of the proposed action. The represents an increase of 0.58 percent in the waste disposed annually at the landfill. The recurring generation of solid waste would decrease the life of the landfill by about 0.01 percent.

The Altus Landfill has the capacity to accommodate the one-time generation of solid waste from the construction and addition activities. In addition, the amount of solid waste generated under the addition of personnel and students would be within the capacity of the landfill.

4.3.8.2.2 Alternative Action

Impacts at Altus AFB from implementation of the alternative action would be the same as described for the proposed action (Section 4.3.9.2.1).

4.3.8.2.3 No-Action Alternative

Under the no-action alternative, there would be no change from baseline conditions as described in Section 3.1.9.2.

4.3.8.2.4 Cumulative Impacts

Analysis of the potential impacts from other proposed actions within the ROI have been, or are currently being analyzed in separate NEPA documents. These actions are not directly related to the proposed and alternative actions evaluated in this EA, but are additional actions identified within the ROI.

Solid wastes generated within the ROI would cumulatively decrease the life of the City of Altus Landfill. However, with a capacity of over 2,000,000 tons, it is expected there would be adequate capacity to manage solid waste generated by the proposed and alternative actions, Base Civil Engineer Complex, MFH privatization, and DASR system.

4.3.9.2.5 Mitigative Actions

Since demolition and construction waste generated under the proposed actions would be managed and disposed of by the contractor and existing waste management and disposal facilities are adequate to handle the addition of waste materials, no mitigation measures are required. Much of the waste debris could be pulverized by mechanical grinding prior to disposal to further decrease the volume of waste disposed at the landfill. Such action could reduce the volume of waste sent offsite for disposal by as much as 50 percent.

4.3.8.3 Transportation

4.3.8.3.1 Proposed Action

Under the proposed action, there would be a daily net increase of about 500 permanent party personnel associated with the proposed action. Based on an average vehicle occupancy of 1.3 passengers per vehicle (USAF 2002a), the number of vehicles accessing Altus AFB would increase by about 378 vehicles. Assuming all vehicles would enter and exit the base at least one time per day, about 756 additional entries and exits would occur each day. This would increase the total number of entries and exits at Altus AFB to 7,296 vehicles per day, or an increase of 10.3 percent over baseline conditions (6,540 vehicles per day). In addition, roadways in the vicinity of the installation would experience an increase due to the additional personnel.

The primary impact to the transportation system at Altus AFB and roads in the vicinity of the installation would be from increased congestion during peak traffic hours. The magnitude of which would vary depending on variations in the time of day for travel to and from the base and in vehicle occupancy, the chosen routes of travel to and from the base, and the gate(s) used for entry and exit.

Minor traffic congestion from the construction and addition projects could occur on Altus AFB due to an increase in heavy equipment and contractor vehicles. It is not anticipated the alteration projects would impact transportation. Congestion resulting from the proposed action attributable to the construction and addition activities would be short-term, and would cease upon completion of the projects.

4.3.8.3.2 Alternative Action

Impacts to transportation under the alternative action would be the same as described for the proposed action (Section 4.3.9.3.1).

4.3.8.3.3 No-Action Alternative

There would be no change from baseline conditions as described in Section 3.1.9.3.

4.3.8.3.4 Cumulative Impacts

Transportation within the ROI may experience slight localized short-term impacts during the construction, renovation, addition, and demolition of the proposed facilities due to the operation of construction equipment. However, impacts would be minimized by the short operating period associated with each project.

Cumulative impacts to transportation associated with the addition of permanent party personnel and students associated with the proposed and alternative actions and MFH privatization would be similar to those described for the proposed action. Impacts associated with the MFH privatization are being assessed in a separate NEPA document currently being prepared.

4.3.8.3.5 Mitigative Actions

No impacts to the transportation infrastructures would be anticipated within the ROI for the proposed or alternative action. Therefore, no mitigative actions would be required.

4.3.8.4 Electricity and Natural Gas

4.3.8.4.1 Proposed Action

Approximately 352,315ft^2 of habitable space would be added from the proposed construction of facilities. This would result in an increased demand on electricity and natural gas. Based on unused capacity in the electrical and natural gas distribution systems at Altus AFB and with the regional suppliers (Section 3.1.9.4), the increase in requirements generated by the project activities could be accommodated by each system.

4.3.8.4.2 Alternative Action

The impacts associated with the implementation of the alternative action would be the same as described for the proposed action (Section 4.3.9.4.1).

4.3.8.4.3 No-Action Alternative

As the facilities would not be constructed, the impacts to electricity and natural gas would be the same as described under baseline conditions (Section 3.1.9.4).

4.3.8.4.4 Cumulative Impacts

The proposed and alternative actions and MFH privatization would change the number of people working and living at Altus AFB. The existing electricity supply and distribution systems within the ROI would accommodate the added demand. In addition, the construction of new energy efficient facilities proposed within the ROI would have a slight positive impact to electricity and natural gas consumption.

4.3.8.4.5 Mitigative Actions

Mitigation measures for increased energy requirements would not be required for the proposed action.

4.3.8.5 Sanitary Sewer

4.3.8.5.1 Proposed Action

There would be an increase of 425 personnel associated with the proposed action to support the beddown of additional C-17 aircraft. Based on an estimated average wastewater generation rate of 100 gallons per person per day (assuming 230 work days per year), overall wastewater generation within the ROI would increase by about 0.043 mgd over baseline conditions. This equates to an increase 5.6 percent over baseline conditions (0.75 mgd) and the resulting demand of 0.793 mgd is well below the designed capacity of the Southeast WWTP (3.0 mgd).

4.3.8.5.2 Alternative Action

The impacts to the sanitary sewer from implementation of the alternative action would be the same as described for the proposed action (Section 4.3.9.5.1).

4.3.8.5.3 No-Action Alternative

As personnel associated with the beddown of C-17 aircraft would not be added to Altus AFB, the impacts associated with the no-action alternative would be the same as described under baseline conditions (Section 3.1.9.5).

4.3.8.5.4 Cumulative Impacts

Wastewater generation increases due to the proposed and alternative actions and MFH privatization would be appear to be within the designed capacity of the Southeast WWTP. Changes associated with the MFH privatization are currently being assessed in a separate NEPA document. Construction of the Base Civil Engineer Complex and DASR system would not increase wastewater generation within the ROI. Cumulative impacts to the Southeast WWTP are not expected.

4.3.8.5.5 Mitigative Actions

Mitigation measures to protect health and welfare would not be required for the proposed action. Impacts on wastewater treatment and capacities would not occur.

4.3.8.6 Potable Water

4.3.8.6.1 Proposed Action

There would be an increase of 425 personnel associated with the proposed action to support the beddown of additional C-17 aircraft at Altus AFB. Based on an estimated average potable water consumption rate of 107 gallons per person per day (assuming 230 work days per year), overall potable water use for Altus AFB due to personnel consumption would increase by 0.045 mgd from the baseline conditions. This equates to an increase of about 4.6 percent over baseline conditions (0.98 mgd) and the resulting demand, 1.025 mgd, is well below the designed capacity of the Altus AFB water distribution system (3.0 mgd).

4.3.8.6.2 Alternative Action

The impacts to potable water from implementation of the alternative action would be the same as described for the proposed action (Section 4.3.9.6.1).

4.3.8.6.3 No-Action Alternative

As personnel associated with the beddown of C-17 aircraft would not be added to Altus AFB, the impacts associated with the no-action alternative to potable water would be the same as described under baseline conditions (Section 3.1.9.6).

4.3.8.6.4 Cumulative Impacts

Increases in the consumption of potable water due to the cumulative addition of permanently assigned personnel, dependents, students, civilian employees, and the construction of facilities at Altus AFB would be appear to be within the designed capacity of the City of Altus. Therefore, cumulative impacts would not occur.

4.3.8.6.5 Mitigative Actions

No impacts to the potable water supply would be anticipated at Altus AFB for the proposed action or alternatives. Therefore, no mitigative actions would be required.

4.3.9 Socioeconomics

The socioeconomic analysis for this effort addressed the potential impacts to population, housing, and the economy within the ROI that could result from the implementation of the proposed action and alternatives.

4.3.9.1 Proposed Action

The proposed training activities would increase the number of permanent-party personnel at Altus AFB to accommodate the proposed C-17 training and support programs. As discussed in Section 3.1.10.1, Jackson County has experienced a steady population decline (1.1 percent, or approximately 316 people) since 1990. The proposed increase in personnel would off-set this decline. Thus, there would be no impact on the housing market or regional economy as a result

of the proposed increase in permanent personnel. Slight benefits would occur to the local economy through the proposed construction and projects.

As part of the proposed action, Altus AFB would increase the average daily student load by 483 people. These students would be housed and trained on base, providing only marginal economic support to local businesses.

Altus AFB is a dynamic installation, with military construction projects occurring every year. The proposed construction activities would be in line with previous years construction budgets, and would not be expecting to generate large economic benefits for the local community.

4.3.9.2 Alternative Action

Under the alternative action, the issues and conditions relating to population, housing, and the local economy would be consistent with those discussed in Section 4.3.9.1.

4.3.9.3 No-Action Alternative

Under the no-action alternative, there would be no change from baseline conditions as described in Section 3.1.11.

4.3.9.4 Cumulative Impacts

The proposed action and all other announced actions for Altus AFB would take place in the vicinity of the base, and would not be expected to increase the population of the base, draw from the local housing market, or contribute to the local economy. Therefore, no cumulative effects are anticipated.

4.3.9.5 Mitigative Actions

Mitigation measures would not be required for the proposed or alternative actions.

4.3.10 Airspace

As discussed in Section 2.2, a sortie is a single military aircraft flight from initial takeoff through the termination landing. An airfield operation is a single movement or individual portion of a flight within the airfield airspace. Therefore, a sortie could contain several airfield operations. Because the airfield operation describes actual activity in the airfield environment, it is the most appropriate measure to use when describing impacts to airspace operations.

4.3.10.1 Proposed Action

Under the proposed action, the number of activities within Altus AFB airspace would increase to a maximum of 357 daily operations. No new aircraft types would be added to the aircraft that operate in the ROI. The existing air traffic control procedures, and airspace allocated for air traffic control services, could accommodate the additional operations. Therefore, impacts to airspace are not expected.

4.3.10.2 Alternative Action

Under the alternative action, a maximum of approximately 357 aviation operations would be conducted from Altus AFB during the peak condition, and approximately 349 operations would be conducted in the end-state condition. As with the proposed action, no new aircraft types would be added to the aircraft that operate in the ROI. The existing air traffic control procedures, and airspace allocated for air traffic control services, could accommodate the additional operations. Therefore, impacts to airspace are not expected.

4.3.10.3 No-Action Alternative

Under the no-action alternative, there would be no change from baseline conditions as described in Section 3.1.12.

4.3.10.4 Cumulative Impacts

Airspace is not associated with the Base Civil Engineer Complex, MFH privatization, and DASR system projects. Cumulative impacts would be the same as described for the proposed or alternative actions. Therefore, cumulative impacts to airspace are not expected.

4.3.9.5 Mitigative Actions

Mitigation measures would not be required for the proposed or alternative actions.

4.4 DESCRIPTION OF THE EFFECTS OF ALL ALTERNATIVES ON THE AFFECTED ENVIRONMENT FOR VICINITY OF SOONER DROP ZONE

4.4.1 Noise

Currently there are no C-5 aircraft operations at Sooner DZ. As such, there would be no separation between peak or end-state conditions in the noise analysis at Sooner DZ for either the proposed action or alternative action.

4.4.1.1 Proposed Action

Under the proposed action, there are no activities planned for the Sooner DZ vicinity. Therefore, there would be no change from baseline conditions as described in Section 3.2.2.

4.4.1.2 Alternative Action

Under the alternative action, aviation operations by Altus AFB-based aircraft would be conducted in the vicinity of Sooner DZ. Additionally, under this alternative, an ALZ would be developed near this location at one of two potential sites. Under this alternative action, about 163 aviation operations would be conducted at either Sooner ALZ Site 1 or Sooner ALZ Site 2. These operations are shown in Table 4-23.

Table 4-23 Average Daily Operations, Alternative Action, Vicinity of Sooner Drop Zone

Activity	Arrivals		Departures		Closed Patterns	
	Day	Night	Day	Night	Day	Night
DZ Operations	0.000	0.000	0.000	0.000	10.714	3.571
ALZ Operations	8.948	3.480	8.948	3.480	36.079	14.032
NVG Operations	1.190	1.190	1.190	1.190	1.190	1.190
Total	**10.138**	**4.670**	**10.138**	**4.670**	**47.983**	**18.793**

Note: Daily operations are based on averages of annual operations; therefore, numbers do not round.
[1] - Since closed patterns are essentially an arrival and takeoff, the 66.776 closed patterns shown equate to 133.552 aviation operations.

The noise contours resulting from the proposed operations associated with Sooner ALZ Sites 1 and 2 are illustrated in Figures 4-5 and 4-6, and the land areas exposed to elevated noise levels are compared with current conditions in Tables 4-24 and 4-25.

Table 4-24 Change in Land Areas Exposed to Indicated Sound Levels, Alternative Action, Sooner Assault Landing Zone Site 1

Condition	Day-Night Average Noise Level (L_{dn}dBA)					
	65-70	70-75	75-80	80-85	85+	Total
Acres						
Baseline	233.2	0	0	0	0	**233.2**
Proposed Peak	2,325.4	740.1	296.7	133.5	87.8	**3,583.5**
Change	2092.2	740.1	296.7	133.5	87.8	**3,350.3**
Population						
Baseline	0	0	0	0	0	**0**
Proposed Peak	1	0	0	0	0	**1**
Change	1	0	0	0	0	**1**
Persons Annoyed[1]						
Baseline	0	0	0	0	0	**0**
Proposed Peak	0	0	0	0	0	**0**

Source: NOISEMAP; USCB 2002
[1] - Estimated based on average annoyance levels for indicated exposure.

As indicated in Table 4-24, only one person would be exposed to noise levels between L_{dn} 65 and 70 at Sooner ALZ Site 1. The number exposed (1 person) indicated on the table is estimated based on census tract population data and the relative population of the tract exposed to noise levels of L_{dn} 65 dBA and above. However, no residences would be within the L_{dn} 65 dBA noise exposure area. It is unlikely that high annoyance would be experienced.

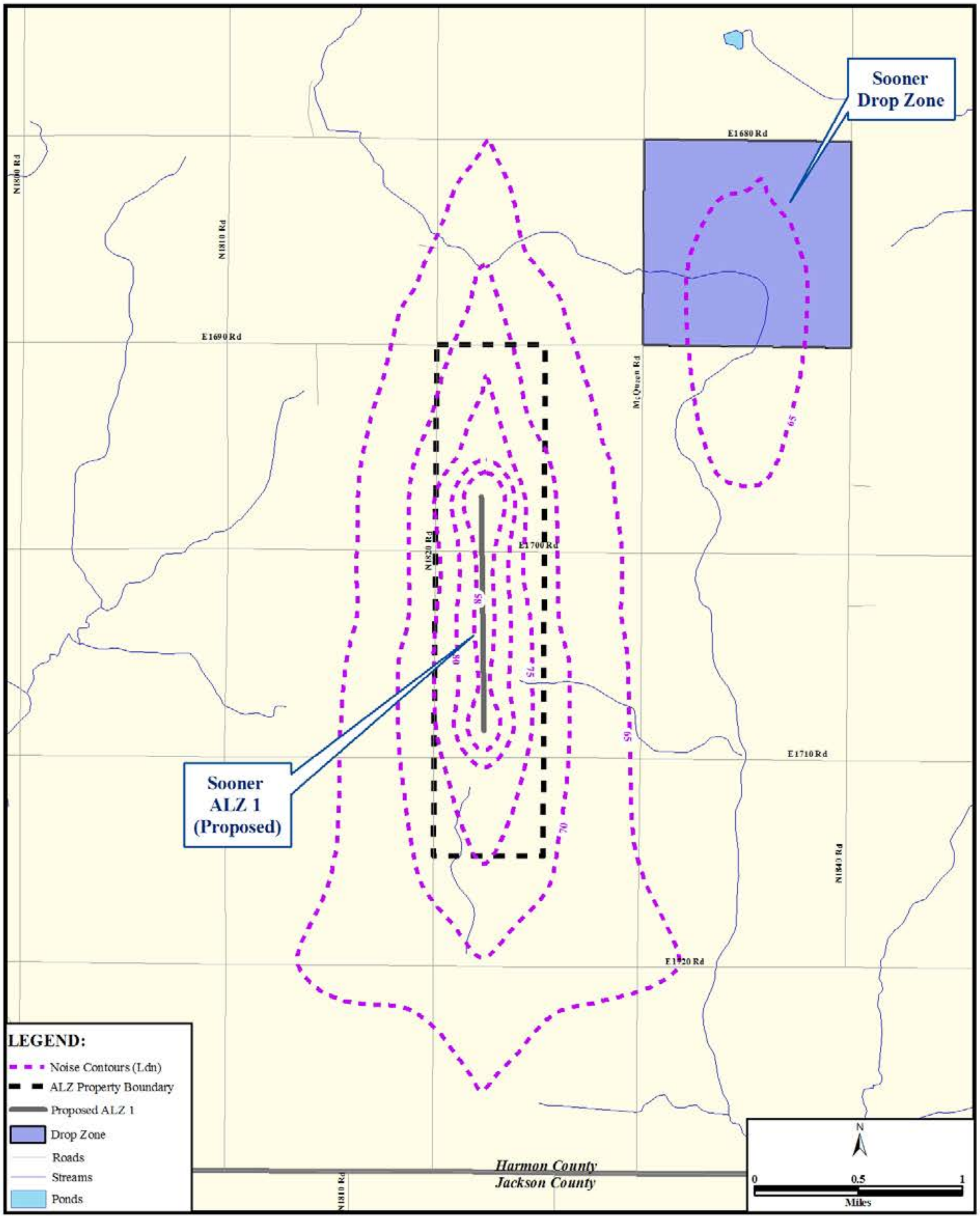


Figure 4-5 Noise Contours, Alternative Action, Sooner Assault Landing Zone Site 1

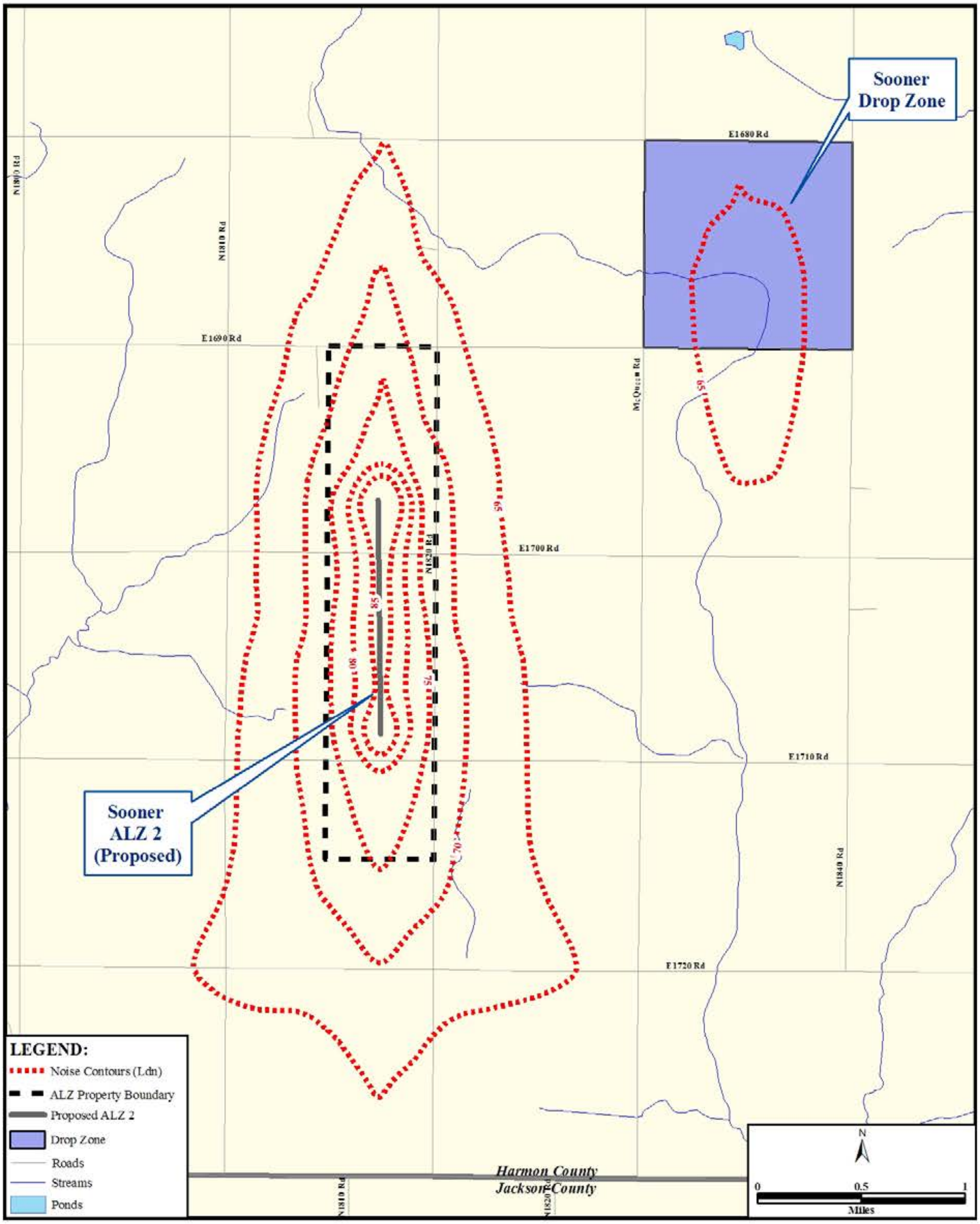


Figure 4-6 Noise Contours, Alternative Action, Sooner Assault Landing Zone Site 2

Table 4-25 Change in Land Areas Exposed to Indicated Sound Levels, Alternative Action, Sooner Assault Landing Zone Site 2

Condition	Day-Night Average Noise Level (L_{dn}dBA)					
	65-70	**70-75**	**75-80**	**80-85**	**85+**	**Total**
Acres						
Baseline	233.2	0	0	0	0	**233.2**
Proposed Peak	2,220.7	736.2	295.9	133.3	87.6	**3,473.7**
Change	1987.5	736.2	295.9	133.3	87.6	**3240.5**
Population						
Baseline	0	0	0	0	0	**0**
Proposed Peak	3	1	0	0	0	**4**
Change	3	1	0	0	0	**4**
Persons Annoyed[1]						
Baseline	0	0	0	0	0	**0**
Proposed Peak	0	1	0	0	0	**1**

Source: NOISEMAP; USCB 2002
[1] - Estimated based on average annoyance levels for indicated exposure.

As shown, approximately 110 fewer acres of land are exposed to elevated noise levels for the ALZ Site 2 location. This site is further removed from the Sooner DZ, and interaction of flight activities between the two is reduced.

As indicated in Table 4-25, four persons would be exposed to noise levels between L_{dn} 65 and 75 at Sooner ALZ Site 2. The number exposed (4 people) indicated on the table is estimated based on census tract population data and the relative population of the tract exposed to noise levels of L_{dn} 65 dBA and above. However, three residences would be within the L_{dn} 65 dBA noise exposure area. It is possible that some of these persons could experience high annoyance. Overall, noise impacts are minimal.

As shown in Figures 4-5 and 4-6, the northern portion of the noise contour associated with the Sooner DZ differs slightly with the location of the ALZ. Detailed analysis shows that the change is approximately 0.1 dB, and is influenced by a flight track associated with use of the ALZ. As the ALZ location shifts to the west, the influence of this flight track also shifts to the west creating the change in the DZ contour.

Under the alternative action, noise would be generated by ALZ construction activities. However, such noise sources would be localized, intermittent, and of relatively short duration. In addition, noise generated from the construction and demolition projects would occur in a sparsely populated setting reducing impacts. The temporary increase in noise levels would not be expected to alter the overall acoustic characteristics of the ROI.

4.4.1.3 No-Action Alternative

Under the no-action alternative, there would be no change from the baseline conditions described in Section 3.2.2.

4.4.1.4 Cumulative Impacts

Noise contours result from the construction and operation of an ALZ near the Sooner DZ and Sooner DZ expansion activities would be the same as depicted on Figure 4-5. The figure depicts the impacts associated with the selection of Sooner ALZ Site 1 and the Sooner DZ expansion and represents the maximum impacts that would occur. In addition, long-term increases in noise are not expected from the construction of the Defense Access Road.

4.4.1.5 Mitigative Actions

Existing baseline noise levels in the vicinity of the Sooner DZ would be increased from the implementation of the alternative action. However, there would be no impacts to sensitive receptors as a result of the proposed or alternative actions. Therefore, mitigation measures would not be required.

4.4.2 Air Quality

Criteria to determine the significance of air quality impacts are discussed in Section 4.3.2, and will be identical to those used to determine potential impacts to the air surrounding Altus AFB. Detailed air pollutant emission calculations are presented in Appendix C.

4.4.2.1 Proposed Action

Under the proposed action some of the redistribution of aircraft operations discussed in 4.3.2.1 would occur at Sooner DZ. Projected aircraft emissions were calculated using the same emission data and assumptions as outlined in Section 4.3.2.1 for Altus AFB. Data representing the changes in operations at Sooner DZ are presented in Table 4-26. There is no predicted increase in indirect emissions associated with this location.

Table 4-26 Change in Aircraft Emissions from Peak and End-State Conditions, Transition Training, Proposed Action, Sooner Drop Zone Vicinity

Location	Annual Emissions Increase (Tons/Year)				
	CO	VOC	NO_x	SO_x	PM_{10}
Sooner DZ	71.5	10.0	500.2	42.7	115.5

For evaluation of regional impacts, these emissions are combined with emissions from Altus AFB, CSIA, and the MTRs and presented as net changes in air emissions for AQCR 189 under the proposed action as discussed in Section 4.3.2.1.

4.4.2.2 Alternative Action

Under the alternative action, an ALZ would be constructed at Sooner DZ if one of the two potential ALZ sites at Sooner DZ were selected. The same analysis, assumptions, parameters, and methodology used for the alternative action at Altus AFB were used for the Sooner DZ component of the alternative action.

Construction Emissions

Emissions from construction of a potential ALZ at Sooner DZ under the alternative action were calculated based on the same emission data and assumptions outlined in Section 4.3.2.2 for Altus AFB. Emissions from construction activities at Sooner DZ are presented on Table 4-27.

Table 4-27 Estimated Emissions Associated with the Construction of an Assault Landing Zone, Alternative Action, Sooner Drop Zone Vicinity

Construction Activities (FY)	Annual Pollutant Emissions (Tons/Year)				
	CO	VOC	NO_x	SO_x	PM
Construction & Grading (FY 05)	11.4	3.0	13.2	0.4	11.5

Operational Emissions

The addition of a potential ALZ site would account for any changes in air emissions at Sooner DZ under the alternative action. There would be no changes to the current drop-zone training currently accomplished at Sooner DZ. There is no predicted increase in indirect emissions associated with this location. For evaluation of regional impacts, operational emissions at Sooner DZ are combined with emissions from Altus AFB, CSIA, and the MTRs and presented as net changes in air emissions for AQCR 189 under the alternative action as discussed in Section 4.3.2.2.

4.4.2.3 No-Action Alternative

Under the no-action alternative, the baseline operating conditions, and the resultant levels of air pollutant emissions, would continue. Therefore the air quality, as described in Section 3.2.3.3, would not be impacted by this alternative.

4.4.2.4 Cumulative Impacts

Additional construction related emissions occurring at Sooner DZ would further add to the net increase in emissions within AQCR 189. However, the projects discussed in Section 2.7 (Sooner DZ Expansion and Defense Access Road) would not result in an appreciable net increase in occupied space or manpower loading. Emissions related to the Sooner DZ Expansion and Defense Access Road construction activities would be non-recurring and estimates are presented in Table 4-28. For the purposes of estimating emissions associated with the construction of the Defense Access Road, it was assumed that emissions would be similar to those associated with construction of the ALZ.

Table 4-28 Estimated Increase in Pollutant Emissions, Proposed Action, Air Quality Control Region 189

Emissions Source	Pollutant Emissions (tons)					
	CO	VOCs	NO_x	SO_x	PM_{10}	Pb
Sooner Drop Zone Expansion[a]	0.14	0.03	0.36	0.04	0.72	0.00
Defense Access Road[b]	11.4	3.0	13.2	0.4	11.5	0.00
ALZ Construction[c]	11.4	3.0	13.2	0.4	11.5	0.00
AQCR 189 Baseline Emissions[d]	2,662.8	2,401.1	10,615.2	1,330.0	530.3	NR
Increase from Baseline (%)[e]	**0.86**	**0.25**	**0.25**	**0.06**	**0.14**	**0.00**

a Source: USAF 2003a
b Estiamted
c See Section 4.4.2.2
d Source: ODEQ 1996
e Percent increase assumes emissions from all projects would occur simultaneously.
Note: NR = not reported, CO = carbon monoxide, VOC = volatile organic compound, NO_x = nitrogen oxide, SO_x = sulfur oxide, PM_{10} = particulate matter equal to or less than 10 microns in diameter, Pb = lead, ALZ = Assault Landing Zone

Therefore, operations resulting from the proposed cumulative projects would not result in an increase in direct or indirect emissions. Since the increase in emissions under both the proposed and alternative actions for FY 11 falls below the USEPA PSD criteria of 250 tpy, it is not expected that there would be long-term cumulative impacts to air quality in the region.

4.4.2.5 Mitigative Actions

Mitigation measures to protect human health and welfare would not be required, since the implementation of the proposed and alternative actions would not result in impacts to regional air quality.

4.4.3 Earth Resources

In evaluating impacts on earth resources, several items were examined, including: 1) the degree to which the proposed action and alternatives could potentially disrupt the ground surface and destroy the soil profile through excavation and removal of rock and soil in the construction of facilities; 2) the degree to which the proposed action and alternatives could potentially increase erosion caused by the disturbance of the ground surface during the construction of facilities; and 3) the degree to which the proposed action and alternative eliminates prime farmland.

4.4.3.1 Proposed Action

Under the proposed action, there would be no change from baseline conditions as described in Section 3.2.4.

4.4.3.2 Alternative Action

The ALZ construction project would also require soil disturbances. Soils located at this site have been extensively disturbed through agricultural (soil cultivation) activities. Construction of the ALZ would include soil disturbing activities and would increase soil erosion during the

construction phase. Impacts to earth resources would be minimized by use of standard engineering practices (e.g., application of water for dust control) that reduce erosion.

For ALZ Site 1, the project would temporarily set aside about 572.4 acres of prime farmland regulated by the FPPA. Of this amount, about 23.3 acres would be paved, while the remaining acreage would not be altered. Following completion of the construction of the ALZ, the remainder of the site would be returned for agricultural utilization. For ALZ Site 2, the project would temporarily set aside about 537.1 acres of prime farmland regulated by the FPPA. Of this amount, about 20.4 acres would be paved, while the remaining acreage would not be altered.

Figure 4-7 depicts the alternative locations of the proposed assault landing strip. Identification of the prime farmlands in the project area are detailed on Table 3-13. Currently, 128,868 acres of Class I prime farmland acreage is located in Harmon County (USDA 1984). The potential conversion of either 23.3 or 20.4 acres would result in a net decrease of Class I prime farmland acreage of approximately 0.018 percent and 0.015, respectively. Consultation with the NRCS has determined no adverse impacts to prime farmlands would occur, provided the portions of the property not paved would be returned "back to agricultural utilization after the construction is completed."

4.4.3.3 No-Action Alternative

Under the no-action alternative, soil disturbances would not occur. Therefore, there would be no change from the baseline conditions described in Section 3.2.4.

4.4.3.4 Cumulative Impacts

Construction of facilities anticipated under the proposed and alternative actions, Sooner DZ Expansion, and Defense Access Road construction would involve modification of surface features. Potential cumulative impacts to soils would include increased soil erosion during the construction periods and further conversion of farmland to non-agricultural activities. However, cumulative effects are not expected. Any effects will be minimized due to use of standard engineering practices (e.g., application of water for dust control). Additionally, the NRCS has been consulted with regard to the FPPA relative to prime farmlands, where applicable, and no impacts to prime farmlands were identified.

4.4.3.5 Mitigative Actions

Only minor soil erosion from wind and storm water runoff would be expected during construction activities. Accepted containment procedures, including adequate watering, would be implemented during the construction phases to minimize sediment runoff from the disturbed area. Therefore, given the current conditions and the proposed plans and actions, no mitigation measures are required.

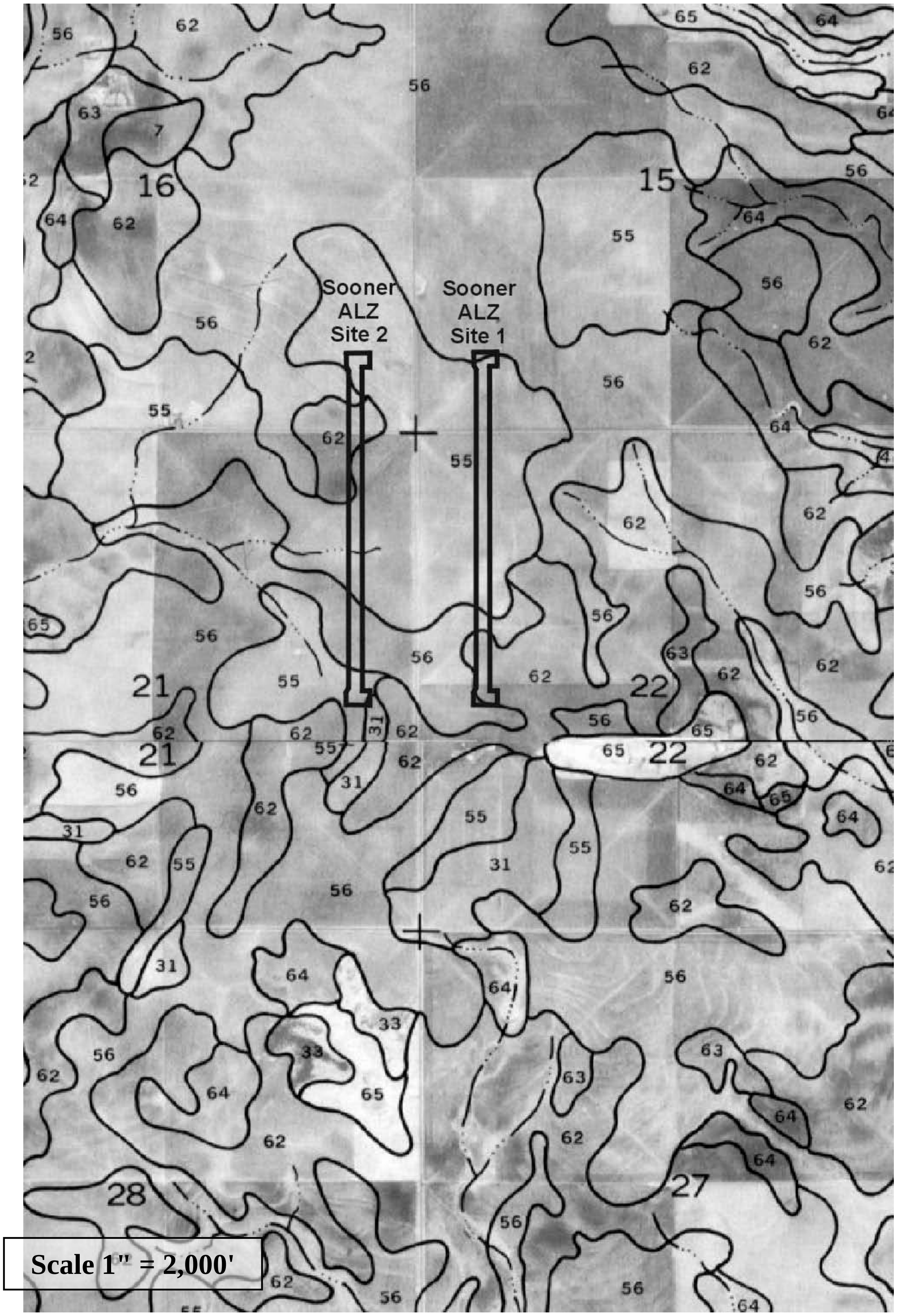


Figure 4-7 Prime Farmlands, Sooner Assault Landing Zones

4.4.4 Water Resources

In evaluating impacts on water resources considered several items, including: 1) the degree to which the proposed action and alternatives change impermeable surface areas; 2) the degree to which the proposed action and alternatives degrade surface water quality; and 3) the degree to which the potential decline in groundwater levels results in a substantial depletion of water resources.

4.4.4.1 Surface Water

4.4.4.1.1 Proposed Action

Under the proposed action, there would be no change from baseline conditions as described in Section 3.2.5.1.

4.4.4.1.2 Alternative Action

The construction of an ALZ at either Sooner ALZ Site 1 or Sooner ALZ Site 2 would increase impervious surface cover by 25.57 acres. Compared to the approximately 1,440 acres of undisturbed land in the vicinity proposed ALZ, this is expected to have a minimal impact on the total amount of impervious cover (2.3 percent) and on the total volume of storm water runoff. The net cumulative effect on storm water at Sooner DZ due to the proposed activities would be minimal when current permitting procedures established for each activity are followed.

4.4.4.1.3 No-Action Alternative

Under the no-action alternative, there would be no change from the baseline conditions described in Section 3.2.5.1.

4.4.4.1.4 Cumulative Impacts

The construction projects associated with the ALZ construction, Defense Access Road construction, and Sooner DZ expansion are expected to cumulatively increase impervious surface cover in the vicinity of the Sooner DZ by an estimated 81 acres. These increases are expected to have a minimal impact on the total amount of impervious cover and on the total volume of storm water runoff. Therefore, the net cumulative effect on storm water due to the proposed activities would be minimal when compared to the whole installation. Table 4-29 provides detail regarding the potential impacts to impervious cover from the various projects.

Table 4-29 Summary of Impervious Cover Impacts, Cumulative Actions

Project	Surface Cover (acres)
Sooner DZ Expansion	7.32
Defense Access Road Construction	48.11
ALZ Construction	25.57
TOTAL:	**81.00**

4.4.4.1.5 Mitigative Actions

Mitigation measures to protect human health and welfare would not be required for the proposed action. Impacts on water resources from the proposed action are minimal when compared to the whole installation.

4.4.4.2 Groundwater

4.4.4.2.1 Proposed Action

Under the proposed action, there would be no change from baseline conditions as described in Section 3.2.5.2.

4.4.4.2.2 Alternative Action

Only shallow excavation would be required for the construction of the ALZ in the vicinity of Sooner DZ. Accordingly, there would be no effect on groundwater from implementation of the proposed action.

4.4.4.2.3 No-Action Alternative

Under the no-action alternative, there would be no change from the baseline conditions described in Section 3.2.5.2.

4.4.4.2.4 Cumulative Impacts

Since there would be no effect on groundwater associated with the proposed action or the proposed ALZ construction, Sooner DZ expansion, or Defense Access Road construction, there would be no cumulative impacts.

4.4.4.2.5 Mitigative Actions

Mitigation measures to protect health and welfare would not be required for the proposed action.

4.4.5 Hazardous Materials

The evaluation of impacts on hazardous materials included the assessment of the degree to which proposed construction activities could effect the existing environment.

4.4.5.1 Proposed Action

No construction activities are planned for the vicinity of the Sooner DZ under the proposed action; therefore, impacts would be the same as under baseline conditions (Section 3.2.6).

4.4.5.2 Alternative Action

Impacts to hazardous materials and wastes associated with the ALZ construction activities in the vicinity of the Sooner DZ would be the same as described in Section 4.3.5.1.

4.4.5.3 No-Action Alternative

Under the no-action alternative, there would be no change in the management of hazardous wastes as described in Section 3.2.6.

4.4.5.4 Cumulative Impacts

The proposed action would contribute to a potential short-term increase in hazardous materials usage to support other construction actions associated with the ALZ, Defense Access Road, and Sooner DZ expansion. The contribution of the proposed action to hazardous materials use would cease upon completion of the construction activities.

Hazardous wastes are not expected as a result of the ALZ construction activities, Sooner DZ expansion, and Defense Access Road project. Therefore, the cumulative projects would not be expected to contribute cumulatively to hazardous waste generated within the ROI.

4.4.5.5 Mitigative Actions

Spills of liquid products such as fuels, oils, and cleaning solvents should be managed according to the existing installation spill response plans. These documents implement applicable state and federal laws for management of these substances.

4.4.6 Biological Resources

Potential impacts to biological resources are determined by analyzing the proposed action and alternatives within the context of existing conditions for regional biota and ecosystems. An impact to biological resources would be considered if the proposed action would have an adverse impact on threatened or endangered species, substantially diminish habitat for a plant or animal species, substantially diminish a regionally or locally important plant or animal species, interfere substantially with wildlife movement or reproductive behavior, or result in a substantial infusion of exotic plant or animal species.

4.4.6.1 Proposed Action

4.4.6.1.1 Vegetation and Wildlife

The proposed action at the Sooner DZ does not involve construction; therefore, there would be no disturbance of vegetation. Agricultural land and sparse natural vegetation would continue to exist under present conditions under the proposed action.

No construction activities are planned for Sooner DZ under the proposed action. Therefore, no beneficial or adverse impacts to wildlife would result from implementation of the proposed action at the Sooner DZ as described in Sections 3.2.7.1 and 3.2.7.2.

4.4.6.1.2 Threatened and Endangered Species

No construction activities are planned for Sooner DZ under the proposed action. Therefore, no impacts to threatened or endangered species would result from implementation of the proposed action.

4.4.6.1.3 Wetlands

The proposed action at the Sooner DZ does not involve construction activities. Therefore, no wetlands would be impacted.

4.4.6.1.4 Floodplains

The proposed action at the Sooner DZ does not involve construction activities. Therefore, no floodplains would be impacted.

4.4.6.2 Alternative Action

4.4.6.2.1 Vegetation and Wildlife

The implementation of the alternative action at Sooner ALZ Site 1 or Sooner ALZ Site 2 would result in the conversion of approximately 25 acres of land from an intensive agricultural use. Sparse natural vegetation occurs throughout the 25 acres along agricultural waterways and field borders. In addition, compared to the approximately 1,440 acres of undisturbed land in the vicinity proposed ALZs, the implementation of this alternative is expected to have a minimal impact on vegetation in this area.

The area within the vicinity of the Sooner DZ is cultivated and currently provides marginal habitat for wildlife. Compared to the approximately 1,440 acres of undisturbed land in the vicinity proposed ALZs, the implementation of this alternative is expected to have a minimal impact on wildlife habitat in this area.

4.4.6.2.2 Endangered and Threatened Species

Although the construction of an ALZ at either Sooner ALZ Site 1 or Sooner ALZ Site 2 would impact approximately 25 acres of cultivated land, no protected species habitat or designated critical habitat would be impacted. No threatened and endangered species are known to occur in the vicinity of the Sooner DZ. Therefore, no impacts from the alternative action are anticipated. In addition, the proposed action would have no impact on the continued existence of the federal and state listed endangered and threatened species that occur in Harmon County. Letters requesting federal and state lists of threatened and endangered species have been forwarded and responses are pending. Copies of this correspondence are enclosed in Appendix B.

4.4.6.2.3 Wetlands

Although approximately 25 acres of lands would be utilized for this alternative, no wetlands are known to occur on this area. Therefore, the implementation of the alternative action in the vicinity of the Sooner DZ would not impact wetlands.

4.4.6.2.4 Floodplains

Although approximately 25 acres of lands would be utilized for this alternative, no floodplains are known to occur on this area. Therefore, the implementation of the alternative action in the vicinity of the Sooner DZ would not impact floodplains.

4.4.6.3 No-Action Alternative

The proposed activities in the vicinity of the Sooner DZ would not take place. Therefore, no impacts to biological resources would occur under the no-action alternative.

4.4.6.4 Cumulative Impacts

Impacts to biological resources are not expected from the ALZ construction, Sooner DZ expansion, and Defense Access Road construction. Therefore, cumulative impacts to biological resources would not occur under the ongoing actions in the vicinity of the Sooner DZ.

4.4.6.5 Mitigative Actions

No impacts to biological resources are anticipated under the proposed or alternative actions; therefore, no mitigation measures beyond best management construction practices are required.

4.4.7 Cultural Resources

Potential impacts were assessed by: 1) identifying types and possible locations of construction activities that could directly or indirectly affect cultural resources, and 2) identifying the nature and potential significance of cultural resources in the potentially affected areas.

Historic properties, under 36 CFR 800, are defined as “any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion, in the NRHP.” This term includes, for the purposes of these regulations, artifacts, records, and remains that are related to and located within such properties. The term “eligible for inclusion in the National Register” includes both properties formally determined as such by the Secretary of the Interior and all other properties that meet National Register listing criteria. Therefore, sites not yet evaluated are considered potentially eligible to the NRHP and are afforded the same regulatory consideration as nominated properties.

As a federal agency, the Air Force is responsible for identifying any historic properties at Sooner DZ. This identification process includes not only field surveys and recording of cultural resources, but also evaluations to develop determinations of significance in terms of NRHP criteria. Completion of this process results in a listing of historic or prehistoric properties subject to federal regulations regarding the treatment of cultural resources.

In compliance with the NHPA, the Air Force has initiated consultation, as directed by Section 106 of the NHPA, with the Oklahoma SHPO.

4.4.7.1 Proposed Action

Under the proposed action, there would be no change from baseline conditions as described in Section 3.2.8.

4.4.7.2 Alternative Action

12 potentially eligible historic sites were identified in the area identified as Sooner ALZ Site 1. Of these sites, two are potentially eligible under the criteria of the NRHP (Appendix B, 34HR127 and 34HR121) for listing on the National Register. Both sites would be avoided during the ALZ construction and mission activities; therefore, there would be no effect on listed or eligible historic resources. Should Sooner ALZ Site 1 be selected, the Air Force would consult with the Oklahoma SHPO to avoid an effect on cultural resources.

17 potentially eligible historic sites were identified in the area identified as Sooner ALZ Site 2. Of these sites, two are potentially eligible for listing on the National Register under the criteria of the NRHP (Appendix B, 34HR46 and 34HR117). Both sites would be avoided during the ALZ construction and mission activities; therefore, there would be no effect on potential historic resources. Should Sooner ALZ Site 2 be selected, the Air Force would consult with the Oklahoma SHPO to avoid an effect on cultural resources.

In July 2003, the Oklahoma SHPO requested that two potentially historic sites not recommended for additional work (34HR111 and 34HR112) be “treated with the same degree of concern as for those locations recommended for avoidance or testing”. Due to the location of the sites on Sooner ALZ Site 2, avoidance would not be possible. Accordingly, if this site is selected, the Air Force would accomplish testing of these potentially historic sites in accordance with Oklahoma SHPO guidance.

4.4.7.3 No-Action Alternative

Under the no-action alternative, there would be no construction projects; therefore, there would be no effect on historic resources as described in Section 3.2.8.

4.4.7.4 Cumulative Impacts

Cultural resources are generally distinct, and the effects of the proposed actions would not be additive. Therefore, there would be no cumulative effects associated with the ALZ construction, Sooner DZ expansion, or Defense Access Road construction. In addition, consultation with the Oklahoma SHPO and the Oklahoma Archaeological Survey has been coordinated for the ALZ construction projects and Sooner DZ expansion. The Defense Access Road consists of improvements to an existing road; therefore, impacts to cultural resources would not occur.

4.4.7.5 Mitigative Actions

If unknown and unexpected archaeological resources are encountered during construction, construction would be halted and specific mitigation would be defined in consultation with the

Oklahoma SHPO and the ACHP, and would be detailed in a Memorandum of Agreement, if applicable, initiated by the Air Force.

In accordance with NHPA, if during the course of program activities, cultural/historical materials (particularly human remains) are unexpectedly discovered, work in the immediate vicinity of the cultural materials shall be halted and the Oklahoma SHPO consulted through the Altus AFB Environmental Office. Subsequent actions would follow guidance provided in 36 CFR 800.11 and in the NAGPRA.

4.4.8 Socioeconomics

4.4.8.1 Proposed Action

Under the proposed action there would be no changes implemented in the vicinity of the Sooner DZ. Thus, there would be no change to the local economy, population of the area, or influence the housing market.

4.4.8.2 Alternative Action

Under the alternative action, changes implemented in the vicinity of the Sooner DZ would be limited to construction and operation of the ALZ. The construction costs would contribute to the local economy. However, given the isolated location of the Sooner DZ area, it would be expected that any economic benefits be dispersed throughout the region. The personnel associated with of the operational requirements of the ALZ would be assigned from Altus AFB. There would be no measurable contribution to the local housing market or economy.

4.4.8.3 No-Action Alternative

Under the no-action alternative, there would be no change from baseline conditions as described in Section 3.2.9.

4.4.8.4 Cumulative Impacts

The proposed action and all other announced actions in the vicinity of Sooner DZ would not be expected to increase the population of the surrounding area, draw from the local housing market, and marginally contribute to the local economy. Therefore, no cumulative effects are anticipated.

4.4.8.5 Mitigative Actions

Mitigation measures would not be required for the proposed or alternative actions.

4.4.10 Transportation

In evaluating impacts on transportation, several items were examined, including: 1) the degree to which a transportation system would have to alter operating practices and personnel requirements to support the action; 2) the capacity required from new or revised transportation systems; and 3) the degree to which the increased demands from the proposed program would reduce the reliability of transportation systems, or aggravate already existing adverse conditions

at the Sooner DZ vicinity. For the evaluation of potential impacts, the ROI for transportation encompasses the immediate vicinity of Sooner DZ vicinity.

4.4.10.1 Proposed Action

Under the proposed action there would be no change in the baseline conditions at the Sooner DZ. Therefore, there would be no impacts to transportation.

4.4.10.2 Alternative Action

Under the proposed action, the number of personnel at the Sooner DZ vicinity would not change. Therefore, the total number of vehicles utilizing the transportation infrastructure would remain at baseline levels.

4.4.10.3 No-Action Alternative

Under the no-action alternative, there would be no change from baseline conditions as described in Section 3.2.10.

4.4.10.4 Cumulative Impacts

The intermittent closure of an one-mile section of county road associated with the Sooner DZ Expansion activities would periodically restrict traffic flow. Given the rural location of the proposed expansion area, minimal impacts to local residents would not be expected. In addition, the proposed construction of a Defense Access Road would offset any inconveniences experienced by citizens traveling in this rural portion of Harmon County.

4.4.10.5 Mitigative Actions

Mitigation measures would not be required for the proposed or alternative actions.

4.5 DESCRIPTION OF THE EFFECTS OF ALL ALTERNATIVES ON THE AFFECTED ENVIRONMENT FOR CLINTON-SHERMAN INDUSTRIAL AIRPARK

4.5.1 Noise

4.5.1.1 Proposed Action

Factors considered in the noise analysis around the proposed airfields and the input requirements for the model were discussed in Section 3.1.2.2. Under the proposed action, approximately 157 daily aviation operations would be conducted at CSIA during the peak condition, and approximately 149 daily operations would be conducted in the end-state condition (once C-5 aircraft have departed). These levels of operations equate to an approximate 48 percent and 50 percent reduction from baseline, respectively. Under baseline conditions, approximately 300 daily operations were conducted at CSIA. However, Air Traffic Control Tower counts from CSIA for 2002 indicate considerable reductions in operations for all aircraft. These current data were used to develop operations for other non-Altus based aircraft, which are then carried forward for subsequent analyses. Details of the operations associated with the proposed action are shown in Tables 4-30 and 4-31.

Table 4-30 Average Daily Operations, Peak Condition, Proposed Action, Clinton-Sherman Industrial Airpark

Aircraft	Arrivals		Departures		Closed Patterns[1]	
	Day	Night	Day	Night	Day	Night
C-5	0.000	0.000	0.000	0.000	13.468	0.000
C-17	1.190	0.000	0.595	0.595	8.333	2.976
KC-135	0.000	0.000	0.000	0.000	19.802	0.000
Other Military	5.615	0.000	5.615	0.000	23.281	0.000
Civil	1.378	0.000	1.378	0.000	2.342	0.000
Total	**8.183**	**0.000**	**7.588**	**0.595**	**67.226**	**2.976**

Note: Daily operations are based on averages of annual operations; therefore, numbers do not round.
[1] - Since closed patterns are essentially an arrival and takeoff, the 70.202 closed patterns shown equate to 140.404 aviation operations.

Table 4-31 Average Daily Operations, End-State Condition, Proposed Action, Clinton-Sherman Industrial Airpark

Aircraft	Arrivals		Departures		Closed Patterns[1]	
	Day	Night	Day	Night	Day	Night
C-17	1.190	0.000	0.595	0.595	8.333	2.976
KC-135	0.000	0.000	0.000	0.000	29.500	0.000
Other Military	5.615	0.000	5.615	0.000	23.281	0.000
Civil	1.378	0.000	1.378	0.000	2.342	0.000
Total	**8.183**	**0.000**	**7.588**	**0.595**	**63.456**	**2.976**

Note: Daily operations are based on averages of annual operations; therefore, numbers do not round.
[1] - Since closed patterns are essentially an arrival and takeoff, the 66.432 closed patterns shown equate to 132.864 aviation operations.

The noise contours resulting from these changed operations are illustrated in Figures 4-8 and 4-9, and the land areas exposed to elevated noise levels are compared with current conditions in Tables 4-32 and 4-33.

Under the proposed action peak condition, land areas and population exposed to elevated noise levels increase. However, in terms of population, although the percentage increases are high, the actual number of additional persons exposed is relatively small. Of the 25 additional persons, approximately 24%, or 6 persons, would be expected to be highly annoyed. This condition would be temporary and would cease upon departure of the C-5 aircraft. Increased exposure is due to the level of closed patterns flown by C-5 and KC-135 aircraft.

Under the proposed action end-state condition, however, due to the cessation of C-5 aircraft operations, the opposite is true. Land areas and population exposed would be reduced 47 and 61 percent, respectively. Additionally, at the end-state condition, there would be no people exposed to noise levels greater than 75 L_{dn}.

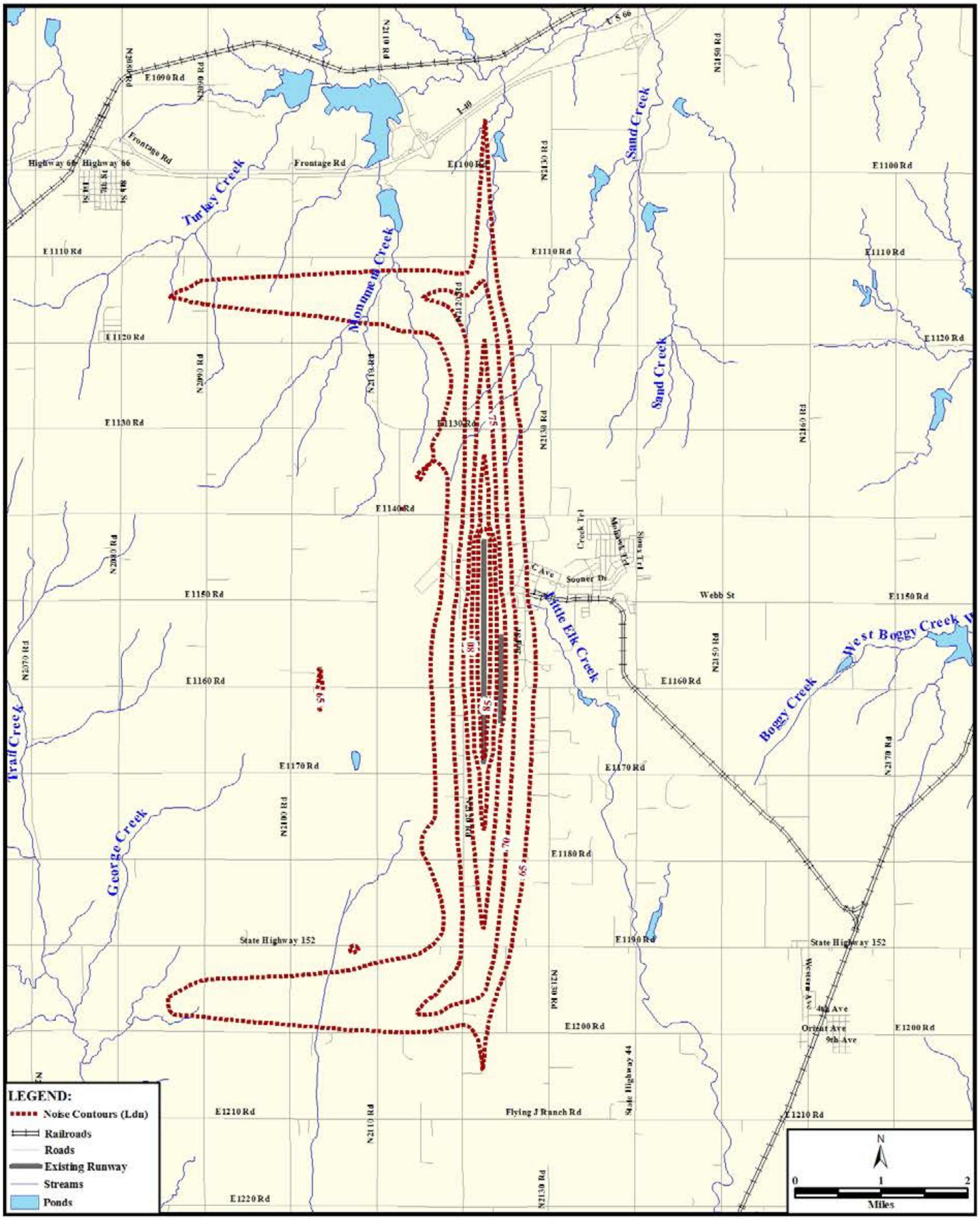


Figure 4-8 Noise Contours, Peak Condition, Proposed Action, Clinton-Sherman Industrial Airpark

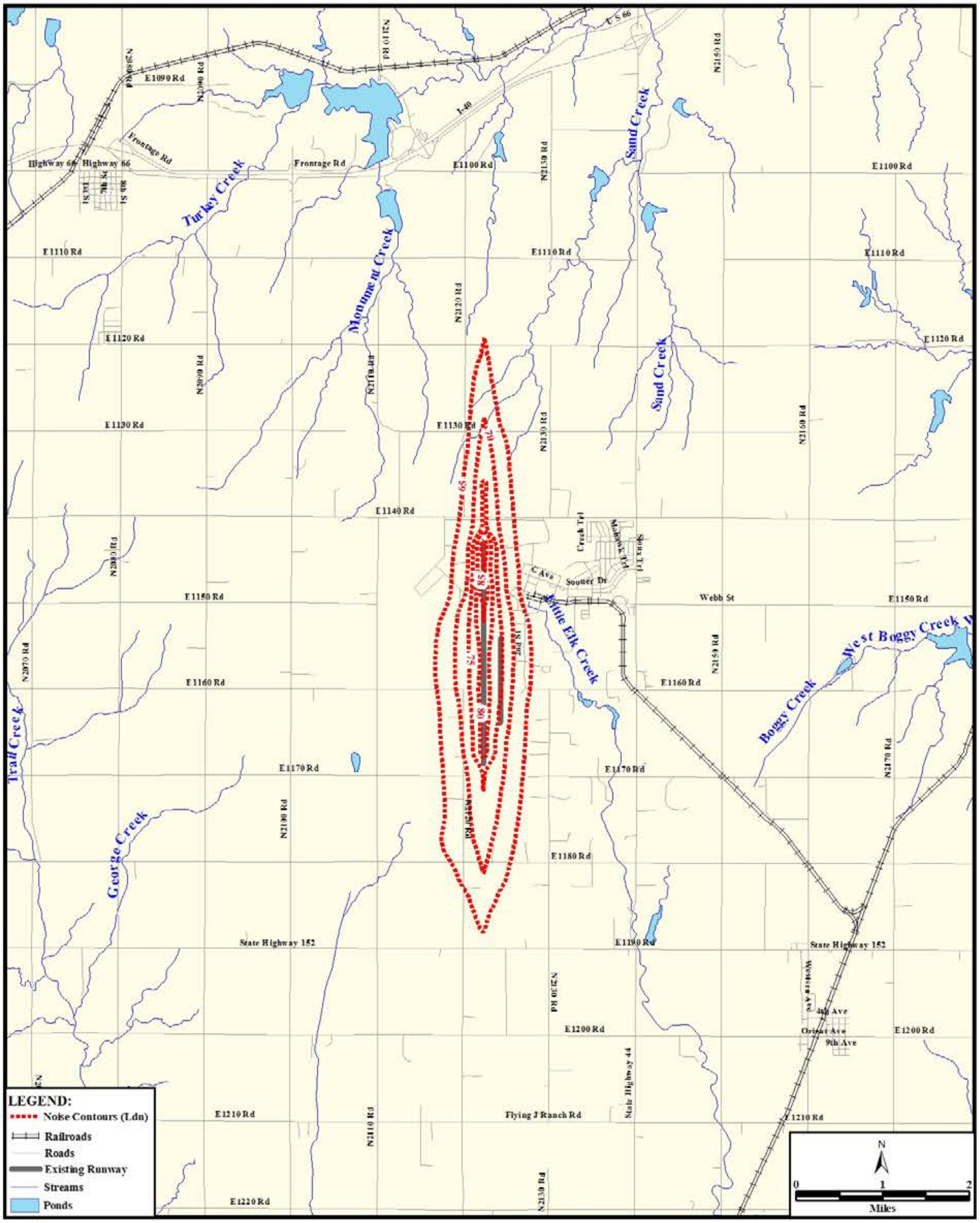


Figure 4-9 Noise Contours, End-State Condition, Proposed Action, Clinton-Sherman Industrial Airpark

Under the proposed action peak condition, L_{dn} increases are slight, ranging from no change to an increase of 2.0 dBA. For the end-state condition, L_{dn} decreases range from 0.1 to 11.6 dB. Therefore, noise within the ROI would experience a positive benefit from the proposed action.

4.5.1.2 Alternative Action

Under the alternative action, aviation operations by Altus-based aircraft would be conducted at CSIA. Additionally, under this alternative, an ALZ would be developed at this location. Under this alternative action, approximately 289 aviation operations would be conducted at CSIA during the peak condition, and approximately 281 operations would be conducted in the end-state condition. These operations reflect an approximate 4 and 6 percent decrease, respectively, from the approximate 300 baseline conditions operations. Details are presented in Tables 4-34 and 4-35.

Under this alternative, in addition to the changed operations, there would be two potential locations for positioning the ALZ. The position just to the west of the existing Runway 35L/17R is identified as Clinton-Sherman Site 1. The second proposed location, further west of Runway 35L/17R is identified as Clinton-Sherman Site 2.

Table 4-32 Change in Land Areas Exposed to Indicated Sound Levels, Peak Condition, Clinton-Sherman Industrial Airpark

Condition	Day-Night Average Noise Level (L_{dn}dBA)					
	65-70	**70-75**	**75-80**	**80-85**	**85+**	**Total**
Acres						
Baseline	3,255.3	1,315.1	589.2	289.3	167.8	**5,616.7**
Proposed Peak	4,753.3	1,702.4	706.3	322.5	204.8	**7,689.3**
Change	1,498.0	387.3	117.1	33.2	37.0	**2,072.6**
Population						
Baseline	36	15	3	0	0	**54**
Proposed Peak	54	20	4	1	0	**79**
Change	18	5	1	1	0	**25**
Persons Annoyed[1]						
Baseline	6	4	1	0	0	**11**
Proposed Peak	9	6	2	0	0	**17**
Change	3	2	1	0	0	**6**

Source: NOISEMAP; USCB 2002
[1] - Estimated based on average annoyance levels for indicated exposure.

Table 4-33 Change in Land Areas Exposed to Indicated Sound Levels, End-State Condition, Clinton-Sherman Industrial Airpark

Condition	Day-Night Average Noise Level (L_{dn}dBA)					
	65-70	70-75	75-80	80-85	85+	Total
Acres						
Baseline	3,255.3	1,315.1	589.2	289.3	167.8	**5,616.7**
Proposed End	1,652.8	776.1	347.9	196.0	22.8	**2,995.6**
Change	-1602.5	-539.0	-241.3	-93.3	-145.0	**-2,621.1**
Population						
Baseline	36	15	3	0	0	**54**
Proposed End	18	3	0	0	0	**21**
Change	-18	-12	-3	0	0	**-33**
Persons Annoyed[1]						
Baseline	6	4	1	0	0	**11**
Proposed End	3	1	0	0	0	**4**
Change	-3	-3	-1	0	0	**-7**

Source: NOISEMAP; USCB 2002
[1] - Estimated based on average annoyance levels for indicated exposure.

Table 4-34 Average Daily Operations, Peak Condition, Alternative Action, Clinton-Sherman Industrial Airpark

Aircraft	Arrivals		Departures		Closed Patterns	
	Day	Night	Day	Night	Day	Night
C-5	0.000	0.000	0.000	0.000	13.468	0.000
C-17	10.138	3.480	9.543	4.075	46.792	18.198
KC-135R	0.000	0.000	0.000	0.000	19.667	0.000
Other Military	5.615	0.000	5.615	0.000	23.281	0.000
Civil	1.378	0.000	1.378	0.000	2.342	0.000
Total	**17.131**	**3.480**	**16.536**	**4.075**	**105.550**	**18.198**

Note: Daily operations are based on averages of annual operations; therefore, numbers do not round.
[1] - Since closed patterns are essentially an arrival and takeoff, the 123.748 closed patterns shown equate to 247.496 aviation operations.

Table 4-35 Average Daily Operations, End-State Condition, Alternative Action, Clinton-Sherman Industrial Airpark

Aircraft	Arrivals		Departures		Closed Patterns	
	Day	Night	Day	Night	Day	Night
C-5	0.000	0.000	0.000	0.000	0.000	0.000
C-17	10.138	3.480	9.543	4.075	46.792	18.198
KC-135R	0.000	0.000	0.000	0.000	29.500	0.000
Other Military	5.615	0.000	5.615	0.000	23.281	0.000
Civil	1.378	0.000	1.378	0.000	2.342	0.000
Total	**17.131**	**3.480**	**16.536**	**4.075**	**101.915**	**18.198**

Note: Daily operations are based on averages of annual operations; therefore, numbers do not round.
[1] - Since closed patterns are essentially an arrival and takeoff, the 120.113 closed patterns shown equate to 240.226 aviation operations.

The peak and end-state condition noise contours resulting from the alternative action operations associated with Clinton-Sherman Site 1 are illustrated in Figures 4-10 and 4-11, and the land areas exposed to elevated noise levels are compared with current conditions in Tables 4-36 and 4-36.

Under the alternative action peak condition involving Clinton-Sherman Site 1, land areas and population exposed to elevated noise levels, and the estimated numbers of persons expected to be highly annoyed increase by more than 100 percent over baseline levels. Under this condition, an additional 57 people become exposed to elevated noise levels, 13 of which would be expected to be highly annoyed. This condition would be temporary and would cease upon departure of the C-5 aircraft. These increases are due to the level of closed patterns flown by C-5 aircraft, and ALZ operations performed by C-17 aircraft.

Under the alternative action end-state, however, noise level impacts would be minimal. Land areas and population exposed would increase 25 and 2 percent, respectively. The population increase equates to one person. Additionally, at the end-state condition, there would be no change to the number of persons expected to be highly annoyed, and no people would be exposed to noise levels greater than 75 L_{dn}. Impacts are minimized due to the cessation of C-5 aircraft operations at CSIA.

Table 4-36 Change in Land Areas Exposed to Indicated Sound Levels, Peak Condition, Alternative Action, Clinton-Sherman Site 1

Condition	Day-Night Average Noise Level (L_{dn}dBA)					
	65-70	70-75	75-80	80-85	85+	Total
Acres						
Baseline	3,255.3	1,315.1	589.2	289.3	167.8	**5,616.7**
Proposed Peak	7,246.4	2,486.7	1,255.4	361.7	262.8	**11,613.0**
Change	3,991.1	1,171.6	666.2	72.4	95.0	**5,996.3**
Population						
Baseline	36	15	3	0	0	**54**
Proposed Peak	76	28	6	1	0	**111**
Change	40	13	3	1	0	**57**
Persons Annoyed[1]						
Baseline	6	4	1	0	0	**11**
Proposed Peak	13	8	3	0	0	**24**
Change	7	4	2	0	0	**13**

Source: NOISEMAP; USCB 2002
[1] - Estimated based on average annoyance levels for indicated exposure.

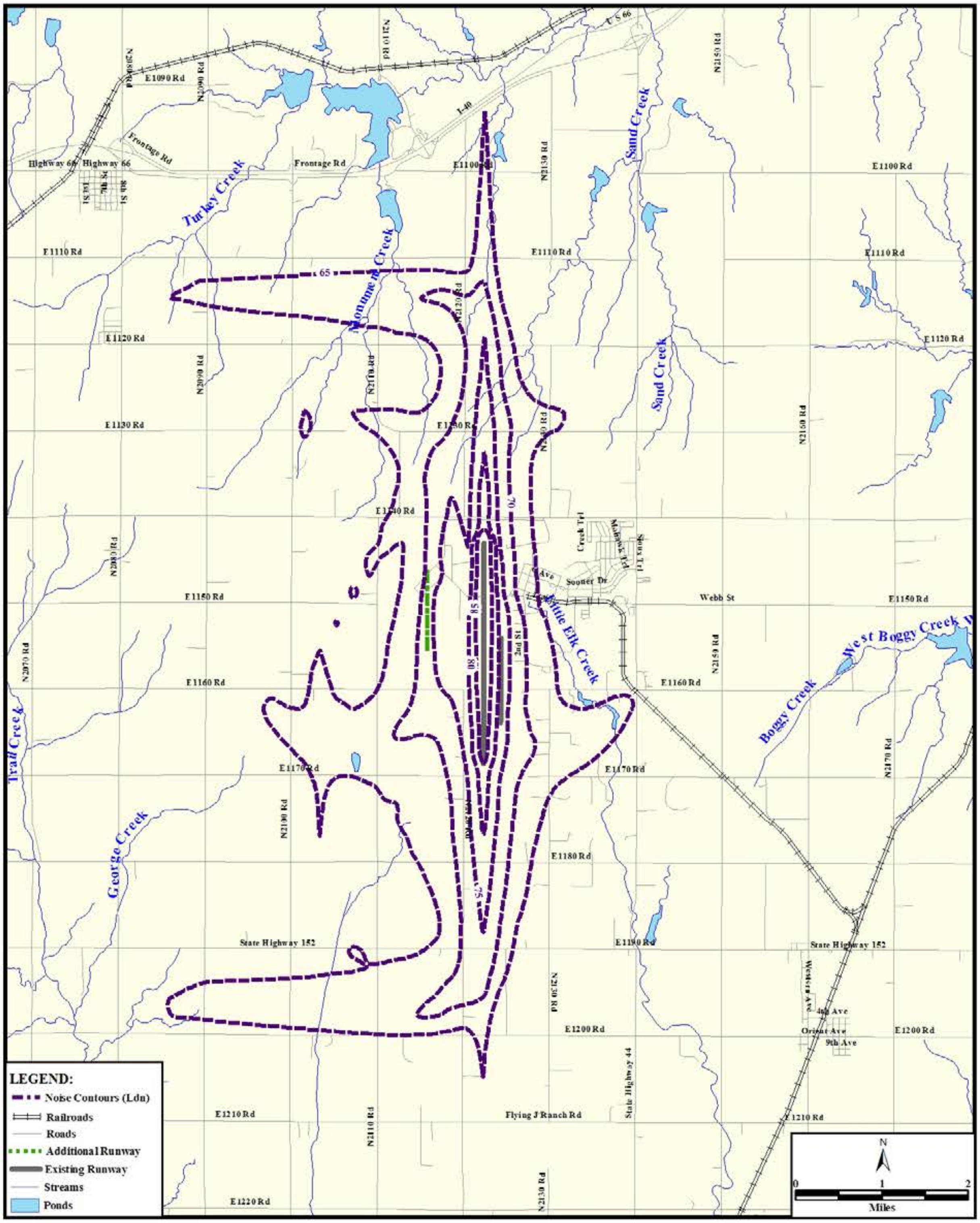


Figure 4-10 Noise Contours, Peak Condition, Alternative Action, Clinton-Sherman Site 1

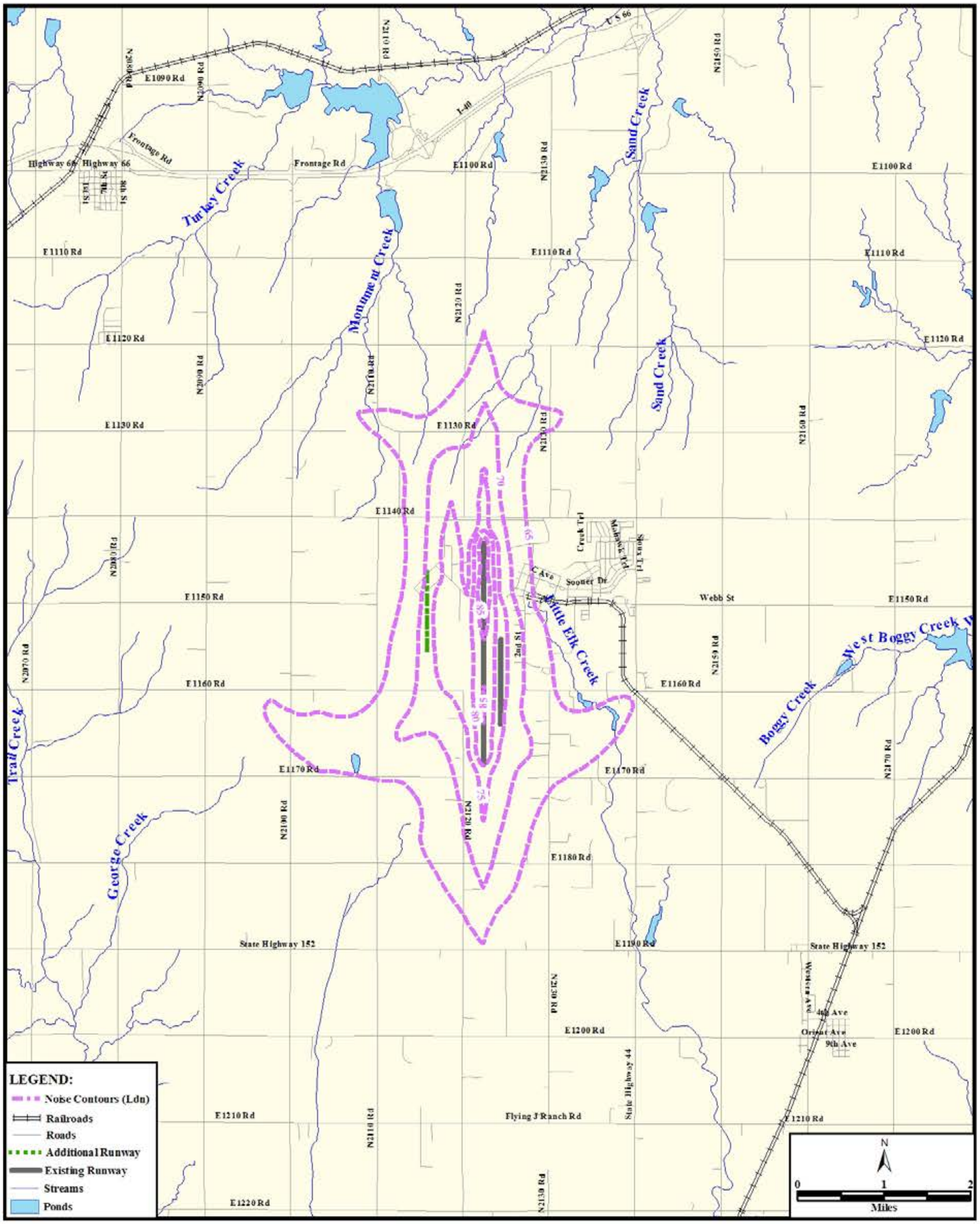


Figure 4-11 Noise Contours, End-State Condition, Alternative Action, Clinton-Sherman Site 1

Table 4-37 Change in Land Areas Exposed to Indicated Sound Levels, End-State Condition, Alternative Action, Clinton-Sherman Site 1

Condition	Day-Night Average Noise Level (L_{dn}dBA)					
	65-70	70-75	75-80	80-85	85+	Total
Acres						
Baseline	3,255.3	1,315.1	589.2	289.3	167.8	**5,616.7**
Proposed End	4,068.2	1,724.2	825.6	313.2	74.0	**7,005.2**
Change	812.9	409.1	236.4	23.9	-93.8	**1388.5**
Population						
Baseline	36	15	3	0	0	**54**
Proposed End	40	13	1	0	1	**55**
Change	4	-2	-2	0	1	**1**
Persons Annoyed[1]						
Baseline	6	4	1	0	0	**11**
Proposed End	7	4	0	0	0	**11**
Change	+1	0	-1	0	0	**0**

Source: NOISEMAP; USCB 2002
[1] - Estimated based on average annoyance levels for indicated exposure.

Under the alternative action peak condition at Clinton-Sherman Site 1, L_{dn} increases are relatively slight. Although they range from 0.1 to 13.1 dB, most of the increases range from 3 to 6 dB. In the end-state at Clinton-Sherman Site 1, L_{dn} decreases at ten locations, remains unchanged at one, and increases at nine. Decreases range from 0.2 to 10.8 dB. Increases range from 0.2 to 12.9 dB.

The peak and end-state condition noise contours resulting from the proposed operations associated with Clinton-Sherman Site 2 are illustrated in Figures 4-12 and 4-13, and the land areas exposed to elevated noise levels are compared with current conditions in Tables 4-38 and 4-39.

Under the alternative action peak condition involving Clinton-Sherman Site 2, land areas and population exposed to elevated noise levels, and the estimated numbers of persons expected to be highly annoyed increase by more than 100 percent over baseline levels. Under this condition, an additional 61 people become exposed to elevated noise levels, 13 of which would be expected to be highly annoyed. This condition would be temporary and would cease upon departure of the C-5 aircraft. These increases are due to the level of closed patterns flown by C-5 aircraft, and ALZ operations performed by C-17 aircraft.

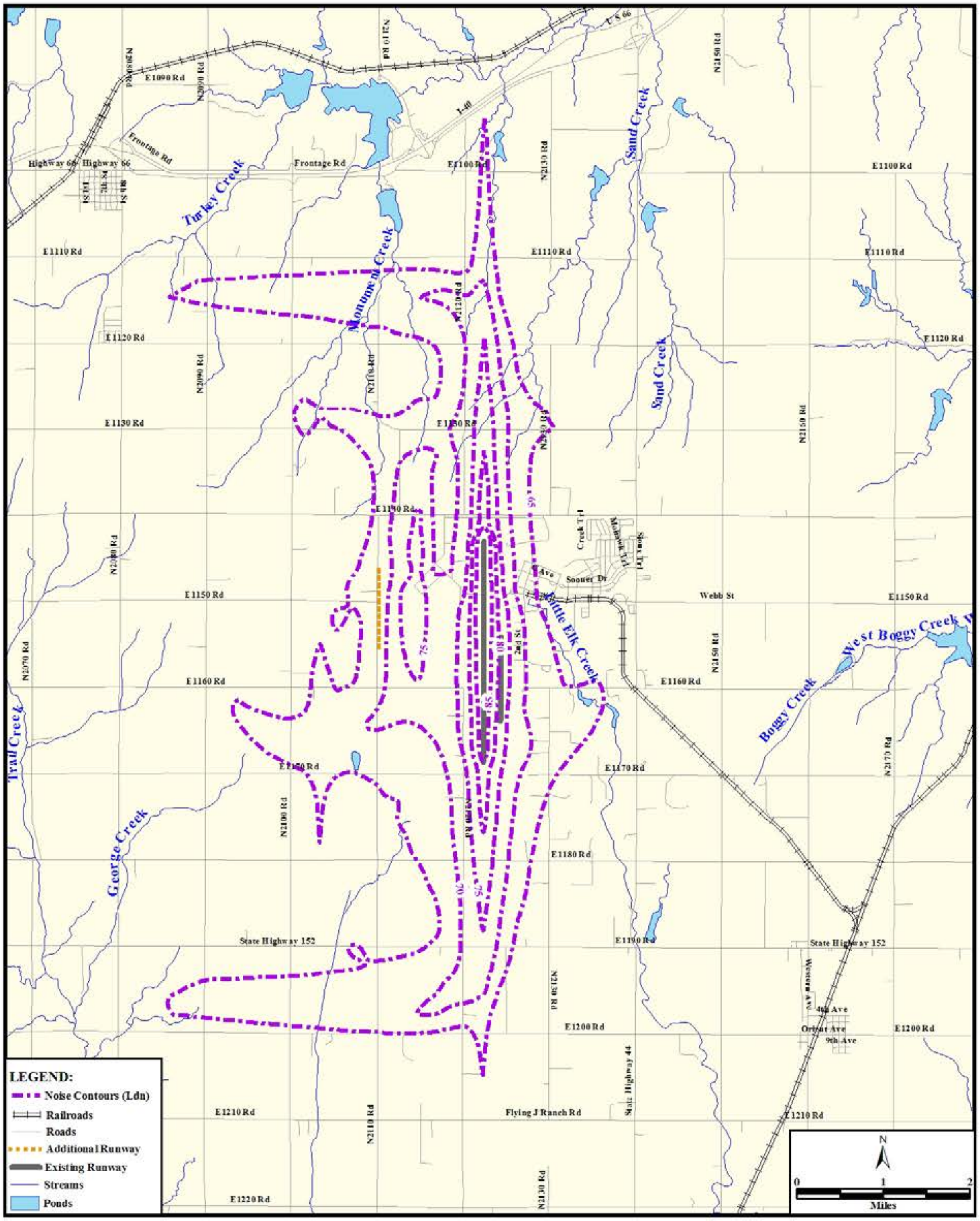


Figure 4-12 Noise Contours, Peak Condition, Alternative Action, Clinton-Sherman Site 2

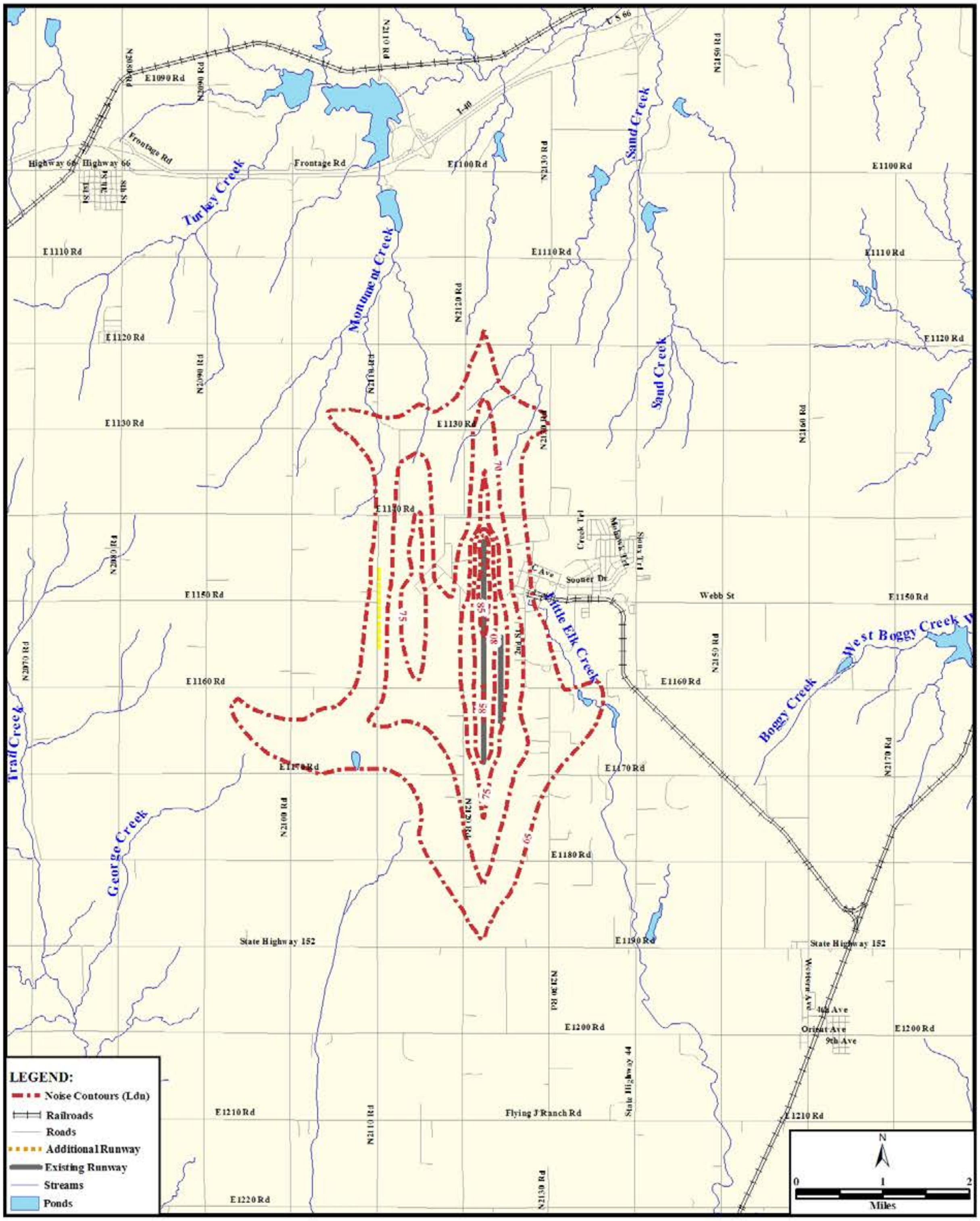


Figure 4-13 Noise Contours, End-State Condition, Alternative Action, Clinton-Sherman Site 2

Table 4-38 Change in Land Areas Exposed to Indicated Sound Levels, Peak Condition, Alternative Action, Clinton-Sherman Site 2

Condition	Day-Night Average Noise Level (L_{dn}dBA)					
	65-70	**70-75**	**75-80**	**80-85**	**85+**	**Total**
Acres						
Baseline	3,255.3	1,315.1	589.2	289.3	167.8	**5,616.7**
Proposed Peak	7,597.5	3,066.9	1,110.9	352.7	255.9	**12,383.9**
Change	4,342.2	1,751.8	521.7	63.4	88.1	**6,767.2**
Population						
Baseline	36	15	3	0	0	**54**
Proposed Peak	79	29	6	1	0	**115**
Change	43	14	3	1	0	**61**
Persons Annoyed[1]						
Baseline	6	4	1	0	0	**11**
Proposed Peak	13	8	2	0	0	**23**
Change	7	4	1	0	0	**12**

Source: NOISEMAP; USCB 2002
[1] - Estimated based on average annoyance levels for indicated exposure.

Table 4-39 Change in Land Areas Exposed To Indicated Sound Levels, End-State Condition, Alternative Action, Clinton-Sherman Site 2

Condition	Day-Night Average Noise Level (L_{dn}dBA)					
	65-70	**70-75**	**75-80**	**80-85**	**85+**	**Total**
Acres						
Baseline	3,255.3	1,315.1	589.2	289.3	167.8	**5,616.7**
Proposed Peak	4,487.4	2,159.5	679.5	300.0	69.8	**7,696.2**
Change	1,232.1	844.4	90.3	10.7	-98.0	**2,079.5**
Population						
Baseline	36	15	3	0	0	**54**
Proposed Peak	42	14	1	0	1	**58**
Change	6	-1	-2	0	1	**4**
Persons Annoyed[1]						
Baseline	6	4	1	0	0	**11**
Proposed Peak	7	4	0	0	0	**11**
Change	1	0	-1	0	0	**0**

Source: NOISEMAP; USCB 2002
[1] - Estimated based on average annoyance levels for indicated exposure.

Under the alternative action end-state condition, however, noise level impacts would be minimal. Land areas and population exposed would increase 37 and 7 percent, respectively. The population increase equates to four people. At the end-state condition, there would be no change to the number of persons expected to be highly annoyed, and no people would be exposed to noise levels greater than 75 L_{dn}. Impacts are minimized due to the cessation of C-5 aircraft operations at CSIA.

Under the alternative action peak condition at Clinton-Sherman Site 2, L_{dn} increases are relatively slight, ranging from 0.1 to 7.1 dB. In the end-state at Clinton-Sherman Site 2, L_{dn} decreases at ten locations, and increases at ten. Decreases range from 1.5 to 10.8 dB. Increases range from 0.1 to 7.0 dB.

Under the alternative action, noise would be generated by ALZ construction activities. However, such noise sources would be localized, intermittent, and of relatively short duration. In addition, noise generated from the construction and demolition projects would occur in a sparsely populated setting reducing impacts. The temporary increase in noise levels would not be expected to alter the overall acoustic characteristics of the ROI.

4.5.1.3 No-Action Alternative

Under the no-action alternative, there would be no change from the baseline conditions described in Section 3.4.1.

4.5.1.4 Cumulative Impacts

The construction and operation of the Oklahoma Commercial Space Launch and Landing Site has been proposed at CSIA. The analysis of the proposed activities is currently underway and a decision is anticipated in 2004. An increase in aircraft operations would result from the spaceport activities and construction and operation of an ALZ in the vicinity of CSIA. Cumulative increases in noise are anticipated. The anticipated results of the development of an ALZ are discussed in this document. Noise resulting from the operation of the Space Launch and Landing Site would be based on proposed operations, and would be fully documented in the environmental documentation required for the licensing of the facility.

4.5.1.5 Mitigative Actions

Existing baseline noise levels and the numbers of individuals exposed to elevated noise levels at CSIA would increase under the proposed action and alternatives under peak conditions. However, under the end-state condition for the proposed action, the numbers of individuals exposed decreases. Under the end-state condition for both alternatives, there are slight increases in the population exposed, but all increases occur in the 65 to 70 L_{dn} level. Persons exposed decreases in the higher noise regimes. Based on the method of estimating this exposure, the low number of additional persons exposed, and the level of exposure no specific mitigative actions would appear warranted at this time.

4.5.2 Air Quality

Criteria to determine the significance of air quality impacts are discussed in Section 4.3.2. Detailed air pollutant emission calculations are presented in Appendix C.

4.5.2.1 Proposed Action

As part of the proposed action some of the redistribution of aircraft operations discussed in 4.3.2.1 would occur at CSIA. Projected aircraft emissions were calculated using the same emission factors, flight profiles, power settings, and calculation methods as outlined in Section 4.3.2.1 for Altus AFB. Emissions resulting from the changes in operations at CSIA for the peak year and end-state conditions are presented in Table 4-40. There is no predicted increase in indirect emissions associated with this location.

Table 4-40 Change in Aircraft Emissions from Peak and End-State Condition Transition Training, Proposed Action, Clinton-Sherman Industrial Airpark

Location	Annual Emissions Increase (Tons/Year)				
	CO	VOC	NO_x	SO_x	PM_{10}
CSIA (Peak Condition)	1.2	0.7	140.8	12.3	3.2
CSIA (End-State Condition)	-16.3	-3.5	-102.9	-6.0	-9.3

For evaluation of regional impacts, these emissions are combined with emissions from Altus AFB, Sooner DZ, and the MTRs and presented as net changes in air emissions for AQCR 189 under the proposed action as discussed in Section 4.3.2.1.

4.5.2.2 Alternative Action

Under the alternative action, some of the aircraft operations assigned to Altus AFB would be redistributed to CSIA. In addition to this redistribution of aircraft operations, one ALZ would be constructed if one of the two potential ALZ sites at CSIA were selected. The same analysis assumptions, parameters, and methodology used for the alternative action at Altus AFB were used for the CSIA component of the alternative action.

Construction Emissions

Emissions from construction of a potential ALZ at CSIA under the alternative action were calculated based on the same emission data and assumptions outlined in Section 4.3.2.2 for Altus AFB. Emissions from construction activities at CSIA for FY 05 are presented on Table 4-41.

Table 4-41 Estimated Emissions Associated with the Construction of an Assault Landing Zone, Alternative Action, Clinton-Sherman Industrial Airpark

Construction Activities (FY)	Annual Pollutant Emissions (Tons/Year)				
	CO	VOC	NO_x	SO_x	PM
Construction & Grading (FY 05)	11.4	3.0	13.2	0.4	11.5

Operational Emissions

Aircraft emission increases would be expected to result from the implementation of the alternative action at CSIA. For evaluation of regional impacts, these emissions are combined with emissions from Altus AFB, Sooner DZ, and the MTRs and presented as net changes in air emissions for AQCR 189 under the alternative action as discussed in Section 4.3.2.2.

4.5.2.3 No-Action Alternative

Under the no-action alternative, the baseline operating conditions, and the resultant levels of air pollutant emissions, would continue. Therefore the air quality, as described in Section 3.3.3.3, would not be impacted by this alternative.

4.5.2.4 Cumulative Impacts

CSIA is a commercially owned airstrip, at which the military shares usage of the airspace and facilities with non-military users. The USAF did not identify any additional projects planned at CSIA. The future unrelated projects at Altus AFB discussed in Section 2-7 have been analyzed for potential impacts to the air quality in AQCR 189. Discussion is presented in Section 4.3.2.4 above.

4.5.2.5 Mitigative Actions

Mitigation measures to protect human health and welfare would not be required, since the implementation of the proposed and alternative actions would not result in impacts to regional air quality.

4.5.3 Earth Resources

In evaluating impacts on earth resources, several items were examined, including: 1) the degree to which the proposed action and alternatives could potentially disrupt the ground surface and destroy the soil profile through excavation and removal of rock and soil in the construction of facilities; 2) the degree to which the proposed action and alternatives could potentially increase erosion caused by the disturbance of the ground surface during the construction of facilities; and 3) the degree to which the proposed action and alternative eliminates prime farmland.

4.5.3.1 Proposed Action

No construction activities are planned for CSIA under the proposed action; therefore, impacts would be the same as under baseline conditions (Section 3.3.4).

4.5.3.2 Alternative Action

The construction of the ALZ at CSIA would require soil disturbances, typical of these activities. Construction projects at CSIA would be located in previously disturbed areas. In addition, prime farmland regulated by the FPPA is not located within either Clinton-Sherman Site 1 or Clinton-Sherman Site 2. Further, impacts to earth resources would be minimized by use of standard engineering practices (e.g., application of water for dust control) that reduce erosion.

4.5.3.3 No-Action Alternative

Under the no-action alternative, soil disturbances would not occur. Therefore, there would be no change from the baseline conditions described in Section 3.3.4.

4.5.3.4 Cumulative Impacts

Construction of facilities anticipated under the proposed and alternative actions would involve modification of surface features. Potential cumulative impacts to soils would include increased soil erosion during the construction periods and further conversion of farmland to non-agricultural activities. However, as projects within the ROI slightly increase soil erosion and the combined effects are minimal and temporary, cumulative effects are not expected. Any effects will be minimized due to use of standard engineering practices (e.g., application of water for dust control). Additionally, prime farmlands are not located at CSIA.

4.5.3.5 Mitigative Actions

Only minor soil erosion from wind and storm water runoff would be expected during construction activities. Accepted containment procedures, including adequate watering, would be implemented during the construction phases to minimize sediment runoff from the disturbed area. Therefore, given the current conditions and the proposed plans and actions, no mitigation measures are required.

4.5.4 Water Resources

In evaluating impacts on water resources considered several items, including: 1) the degree to which the proposed action and alternatives change impermeable surface areas; 2) the degree to which the proposed action and alternatives degrade surface water quality; and 3) the degree to which the potential decline in groundwater levels results in a substantial depletion of water resources.

4.5.4.1 Surface Water

4.5.4.1.1 Proposed Action

No construction activities are planned for CSIA under the proposed action; therefore, impacts would be the same as under baseline conditions (Section 3.3.5.1).

4.5.4.1.2 Alternative Action

The construction of an ALZ at either Clinton-Sherman Site 1 or Clinton-Sherman Site 2 would increase impervious surface cover by 25.57 acres. Compared to the approximately 1,440 acres of undisturbed land in the vicinity proposed ALZ, this is expected to have a minimal impact on the total amount of impervious cover (2.3 percent) and on the total volume of storm water runoff. The net cumulative effect on storm water at CSIA due to the proposed activities would be minimal when current permitting procedures established for each activity are followed.

4.5.4.1.3 No-Action Alternative

Under the no-action alternative, there would be no change from the baseline conditions described in Section 3.3.5.1.

4.5.4.1.4 Cumulative Impacts

The construction projects are expected to cumulatively increase impervious surface cover at CSIA. These are expected to have a minimal impact on the total amount of impervious cover and on the total volume of storm water runoff. Therefore, the net cumulative effect on storm water due to the proposed activities would be minimal when compared to the whole installation

4.5.4.1.5 Mitigative Actions

Mitigation measures to protect human health and welfare would not be required for the proposed action. Impacts on water resources from the proposed action are minimal when compared to the whole installation.

4.5.4.2 Groundwater

4.5.4.2.1 Proposed Action

No construction activities are planned for CSIA under the proposed action; therefore, impacts would be the same as under baseline conditions (Section 3.3.5.2).

4.5.4.2.2 Alternative Action

Only shallow excavation would be required for the construction of the ALZ at CSIA. Accordingly, there would be no effect on groundwater from implementation of the alternative action.

4.5.4.2.3 No-Action Alternative

Under the no-action alternative, there would be no change from the baseline conditions described in Section 3.3.5.2.

4.5.4.2.4 Cumulative Impacts

Since there would be no effect on groundwater associated with the proposed ALZ construction and operation and Sooner DZ expansion projects, there would be no cumulative impacts.

4.5.4.2.5 Mitigative Actions

Mitigation measures to protect health and welfare would not be required for the proposed action.

4.5.5 Hazardous Materials

The evaluation of impacts on hazardous materials included the assessment of the degree to which proposed construction activities could effect the existing environment.

4.5.5.1 Proposed Action

No construction activities are planned for CSIA under the proposed action; therefore, impacts would be the same as under baseline conditions.

4.5.5.2 Alternative Action

Impacts to hazardous materials and wastes associated with the ALZ construction activities at CSIA would be the same as described in Section 4.3.5.1.

4.5.5.3 No-Action Alternative

Under the no-action alternative, there would be no change in the management of hazardous wastes as described in Section 3.3.6.

4.5.5.4 Cumulative Impacts

The alternative action would contribute to a potential short-term increase in hazardous materials usage to support other construction actions. The contribution of the alternative action to hazardous materials use would cease upon completion of the construction activities.

Hazardous wastes are not expected to be generated as a result of the alternative action. Therefore, the alternative action would not be expected to contribute cumulatively to hazardous waste generated from other actions at CSIA.

4.5.5.5 Mitigative Actions

Spills of liquid products such as fuels, oils, and cleaning solvents should be managed according to the existing installation spill response plans. These documents implement applicable state and federal laws for management of these substances.

4.5.6 Biological Resources

Potential impacts to biological resources are determined by analyzing the proposed action and alternatives within the context of existing conditions for regional biota and ecosystems. An impact to biological resources would be considered if the proposed action would have an adverse impact on threatened or endangered species, substantially diminish habitat for a plant or animal species, substantially diminish a regionally or locally important plant or animal species, interfere substantially with wildlife movement or reproductive behavior, or result in a substantial infusion of exotic plant or animal species.

4.5.6.1 Proposed Action

4.5.6.1.1 Vegetation and Wildlife

No construction is proposed under the proposed action at CSIA. Therefore, there would be no disturbance of vegetation. Agricultural land would continue to exist under present conditions under the proposed action.

Although no beneficial or adverse impacts to wildlife would result from implementation of the proposed action at the CSIA, additional land areas would be intermittently exposed to elevated noise levels. These lands do not provide habitat for threatened or endangered species and none of this land is listed as critical habitat for protected species.

4.5.6.1.2 Threatened and Endangered Species

No construction activities are planned for the CSIA under the proposed action. Although no beneficial or adverse impacts to wildlife would result from implementation of the proposed action at the CSIA, additional land areas would be exposed to elevated noise levels resulting from the increased frequency of aircraft using MTRs.

Although additional lands would be intermittently exposed to elevated noise levels, these lands do not provide critical habitat for threatened or endangered species and further none of this land is listed as critical habitat for protected species. Measures, such as those described for Altus AFB, to further reduce potential impacts to protected species would be implemented.

4.5.6.1.3 Wetlands

Because the proposed action at the CSIA does not involve construction, no impacts to wetlands are anticipated.

4.5.6.1.4 Floodplains

Because the proposed action at the CSIA does not involve construction, no impacts to floodplains are anticipated.

4.5.6.2 Alternative Action

4.5.6.2.1 Vegetation and Wildlife

The construction of an ALZ at either Site 1 or Site 2 would result in the conversion of approximately 25 acres of cultivated lands and sparse natural vegetation. Implementation of the alternative action at CSIA is not anticipated to have an adverse impact to vegetation as this area is surrounded by approximately 1,440 acres of lands vegetated by similar species.

Although numerous wildlife species occur in nearby wetlands and upland habitats to the west of CSIA, the conversion of 25 acres of cultivated land is anticipated to have minimal impacts to these species. In addition, CSIA has experienced elevated noise levels since World War II, yet wildlife species continue to thrive in this area, apparently accustomed to the intermittent elevated noise levels (USAF 2002a).

4.5.6.2.2 Endangered and Threatened Species

The construction of an ALZ at either Site 1 or Site 2 would neither impact the habitat of threatened or endangered species, nor would it impact designated critical habitat. Potential impacts from flight operations would be similar to those described for Altus AFB (Section 4.3.6.1.2).

4.5.6.2.3 Wetlands

No impacts to wetlands are anticipated with the implementation of the alternative action at the CSIA. Although wetlands are known to occur near Base Lake and other areas in the vicinity, no wetlands are known to occur within the approximate 25 acres of land proposed for this alternative.

4.5.6.2.4 Floodplains

ALZ construction activities are not located within areas designated in the floodplain; therefore, impacts under the alternative action would not occur.

4.5.6.3 No-Action Alternative

The proposed activities in the vicinity of the proposed action would not take place. Therefore, no impacts to biological resources would occur under the no-action alternative.

4.5.6.4 Cumulative Impacts

It is not anticipated that cumulative impacts to biological resources would occur under the ongoing actions at CSIA.

4.5.6.5 Mitigative Actions

No impacts to biological resources are anticipated under the proposed or alternative actions; therefore, no mitigation measures beyond best management construction practices are required.

4.5.7 Cultural Resources

4.5.7.1 Proposed Action

Under the proposed action, there would be no change from baseline conditions as described in Section 3.3.8.

4.5.7.2 Alternative Action

Research at CSIA ALZ Site 1 identified 11 structures that are 45 years or older. In addition, there are five buildings or structures less than 45 years old and five buildings or structures of unknown construction date that have been demolished. The research identified the demolition was accomplished by the City of Clinton, not by the Air Force and the demolition activities were not related to the proposed project.

Research at CSIA ALZ Site 2 identified no structures that are 45 years or older. In addition, there is one building or structure less than 45 years old and two buildings or structures of unknown construction date that have been demolished. The research identified the demolition was accomplished by the City of Clinton, not by the Air Force and the demolition activities were not related to the proposed project.

Completed Historic Preservation Resource Identification Forms and captioned photographs for historic buildings/structures were submitted to the SHPO. No impacts to historic resources are expected from construction and operations of an ALZ at either location at CSIA.

Consultation with the Oklahoma Archeological Survey in February 2003 did not identify the need for an archeological survey to be conducted at CSIA. Therefore, impacts to archaeologic resources would not occur.

4.5.7.3 No-Action Alternative

Under the no-action alternative, there would be no construction projects; therefore, there would be no effect on historic resources as described in Section 3.3.8.

4.5.7.4 Cumulative Impacts

Historical resources are generally distinct, and the effects of the proposed actions would not be additive. Therefore, there would be no cumulative effects.

4.5.7.5 Mitigative Actions

If unknown and unexpected archaeological resources are encountered during construction, construction would be halted and specific mitigation would be defined in consultation with the SHPO and the ACHP, and would be detailed in a Memorandum of Agreement, if applicable, initiated by the Air Force.

In accordance with NHPA, if during the course of program activities, cultural/historical materials (particularly human remains) are unexpectedly discovered, work in the immediate vicinity of the cultural materials shall be halted and the Oklahoma SHPO consulted through the Altus AFB Environmental Office. Subsequent actions would follow guidance provided in 36 CFR 800.11 and in the NAGPRA.

4.5.8 Socioeconomics

4.5.8.1 Proposed Action

The proposed training activities would not increase the number of personnel at CSIA. Thus, there would be no impact on the housing market or regional economy as a result of the proposed action.

4.5.8.2 Alternative Action

Under the alternative action, changes implemented at CSIA would include the construction and operation of the ALZ. The construction costs would contribute to the local economy; however, it would be expected that any economic benefits be dispersed throughout the region. The personnel associated with of the operational requirements of the ALZ would be minimal; thus, there would be no measurable impact to the local housing market or economy.

4.5.8.3 No-Action Alternative

Under the no-action alternative, there would be no change from baseline conditions as described in Section 3.3.9.

4.5.8.4 Cumulative Impacts

The proposed action and all other announced actions in the vicinity of CSIA would not be expected to increase the population of the area or draw from the local housing market. Slight benefits to the local economy from the proposed construction projects would occur. Therefore, no cumulative effects are anticipated.

4.5.8.5 Mitigative Actions

Mitigation measures would not be required for the proposed or alternative actions.

4.6 DESCRIPTION OF THE EFFECTS OF ALL ALTERNATIVES ON THE AFFECTED ENVIRONMENT FOR AMARILLO INTERNATIONAL AIRPORT

The scope of the proposed action and alternatives at Amarillo IAP is limited to aircraft training operations. As a result only those resources areas that have a potential to be impacted by the proposed action and alternatives are addressed in the following sections.

4.6.1 Noise

4.6.1.1 Proposed Action

Factors considered in noise analysis around airfields and input requirements for the Air Force's BASEOPS/NOISEMAP model were discussed in Section 3.1.2. Under the proposed action, approximately 359 daily aviation operations would be conducted from Amarillo IAP during the peak condition, and approximately 325 operations would be conducted in the end-state condition. These levels represent increases of approximately 20 percent and 19 percent, respectively, over the approximate 300 baseline operations. These operations are shown in Tables 4-42 and 4-43.

Table 4-42 Average Daily Operations, Peak Condition, Proposed Action, Amarillo International Airport

Aircraft	**Arrivals**		**Departures**		**Closed Patterns**	
	Day	**Night**	**Day**	**Night**	**Day**	**Night**
Air Carrier	12.409	0.792	12.409	0.792	0.000	0.000
Air Taxi	20.307	0.846	20.307	0.846	0.000	0.000
Gen. Aviation	31.283	0.639	31.283	0.639	4.966	0.000
C-5	3.802	0.038	3.802	0.038	8.980	0.119
C-17	0.000	0.000	0.000	0.000	7.973	3.099
KC-135	9.504	0.096	9.504	0.096	19.667	3.901
Other Military	24.711	0.250	24.711	0.250	26.234	0.000
Total	**102.016**	**2.661**	**102.016**	**2.661**	**67.820**	**7.119**

Note: Daily operations are based on averages of annual operations; therefore, numbers do not round.
[1] - Since closed patterns are essentially an arrival and takeoff, the 74.939 closed patterns shown equate to 149.878 aviation operations.

Table 4-43 Average Daily Operations, End-State Condition, Proposed Action, Amarillo International Airport

Aircraft	Arrivals		Departures		Closed Patterns	
	Day	Night	Day	Night	Day	Night
Air Carrier	12.409	0.792	12.409	0.792	0.000	0.000
Air Taxi	20.307	0.846	20.307	0.846	0.000	0.000
Gen. Aviation	31.283	0.639	31.283	0.639	4.966	0.000
C-17	0.000	0.000	0.000	0.000	7.973	3.099
KC-135	9.504	0.096	9.504	0.096	29.500	5.849
Other Military	24.711	0.250	24.711	0.250	26.234	0.000
Total	**98.214**	**2.623**	**98.214**	**2.623**	**68.673**	**8.948**

Note: Daily operations are based on averages of annual operations; therefore, numbers do not round.
[1] - Since closed patterns are essentially an arrival and takeoff, the 77.621 closed patterns shown equate to 155.242 aviation operations.

The noise contours resulting from these changed operations are illustrated in Figures 4-14 and 4-15, and the land areas exposed to elevated noise levels are compared with current conditions in Tables 4-44 and 4-45.

Table 4-44 Change in Land Areas Exposed to Indicated Sound Levels, Peak Condition, Proposed Action, Amarillo International Airport

Condition	Day-Night Average Noise Level (L_{dn}dBA)					
	65-70	**70-75**	**75-80**	**80-85**	**85+**	**Total**
Acres						
Baseline	5,206.7	2,697.8	1,378.0	525.7	511.7	**10,319.9**
Proposed Peak	5,684.7	2,823.1	1,436.7	586.6	539.9	**11,071.0**
Change	478.0	125.3	58.7	60.9	28.2	**751.1**
Population						
Baseline	113	36	15	1	0	**165**
Proposed Peak	397	36	16	2	0	**451**
Change	284	0	1	1	0	**286**
Persons Annoyed[1]						
Baseline	19	10	7	1	0	**37**
Proposed Peak	67	10	7	1	0	**85**
Change	48	0	0	0	0	**48**

Source: NOISEMAP; USCB 2002
[1] - Estimated based on average annoyance levels for indicated exposure.

Table 4-45 Change in Land Areas Exposed to Indicated Sound Levels, End-State Condition, Proposed Action, Amarillo International Airport

Condition	Day-Night Average Noise Level (L_{dn}dBA)					
	65-70	**70-75**	**75-80**	**80-85**	**85+**	**Total**
Acres						
Baseline	5,206.7	2,697.8	1,378.0	525.7	511.7	**10,319.9**
Proposed Peak	4,199.9	2,559.7	1,296.0	470.3	489.1	**9,015.0**
Change	-1006.8	-138.1	-82.0	-55.5	-22.6	**-1305.0**
Population						
Baseline	113	36	15	1	0	**165**
Proposed Peak	78	34	14	1	0	**127**
Change	-35	-2	-1	0	0	**-38**
Persons Annoyed[1]						
Baseline	19	10	7	1	0	**37**
Proposed Peak	13	10	6	1	0	**30**
Change	-6	0	-1	0	0	**-7**

Source: NOISEMAP; USCB 2002
[1] - Estimated based on average annoyance levels for indicated exposure.

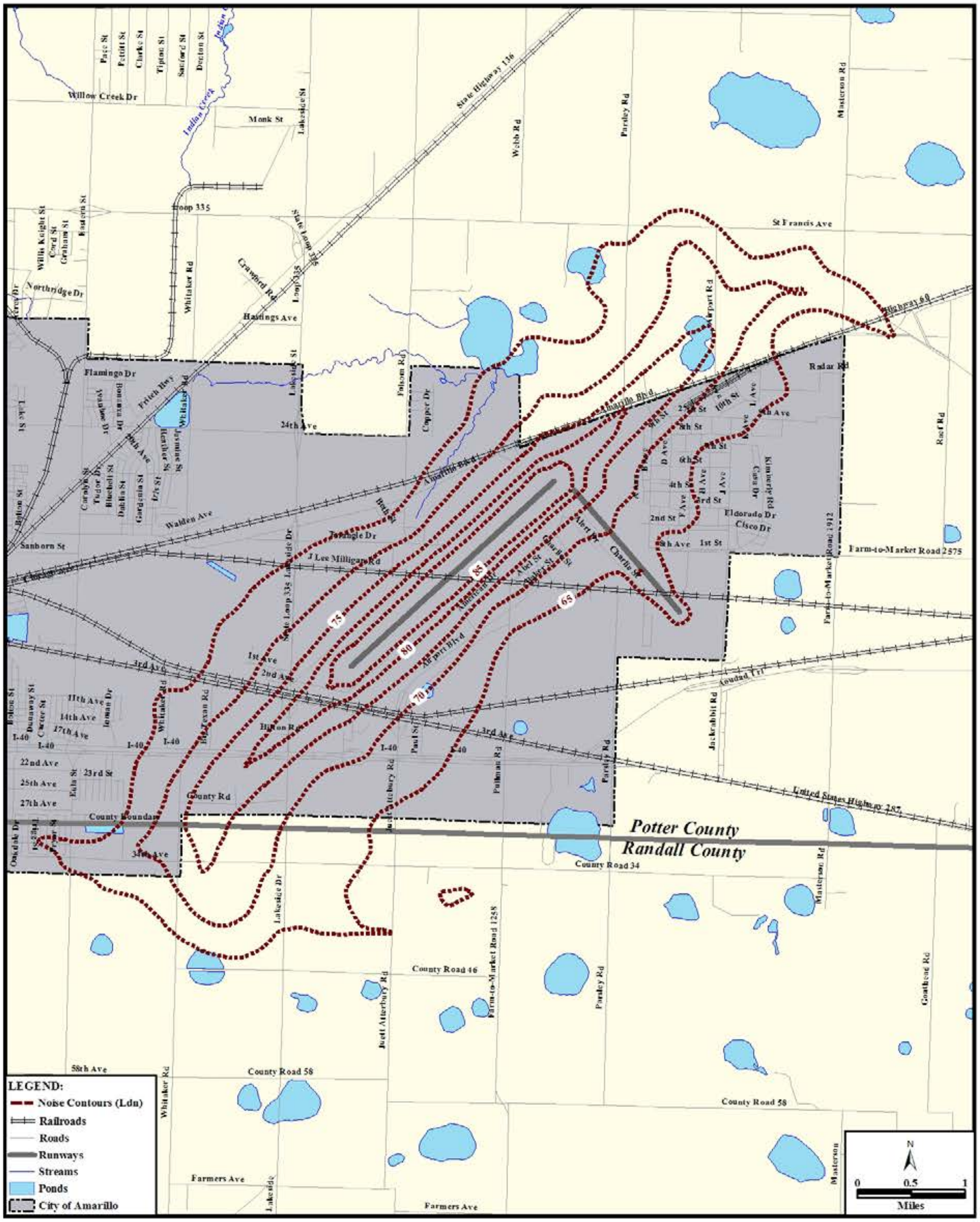


Figure 4-14 Noise Contours, Peak Condition, Proposed Action, Amarillo International Airport

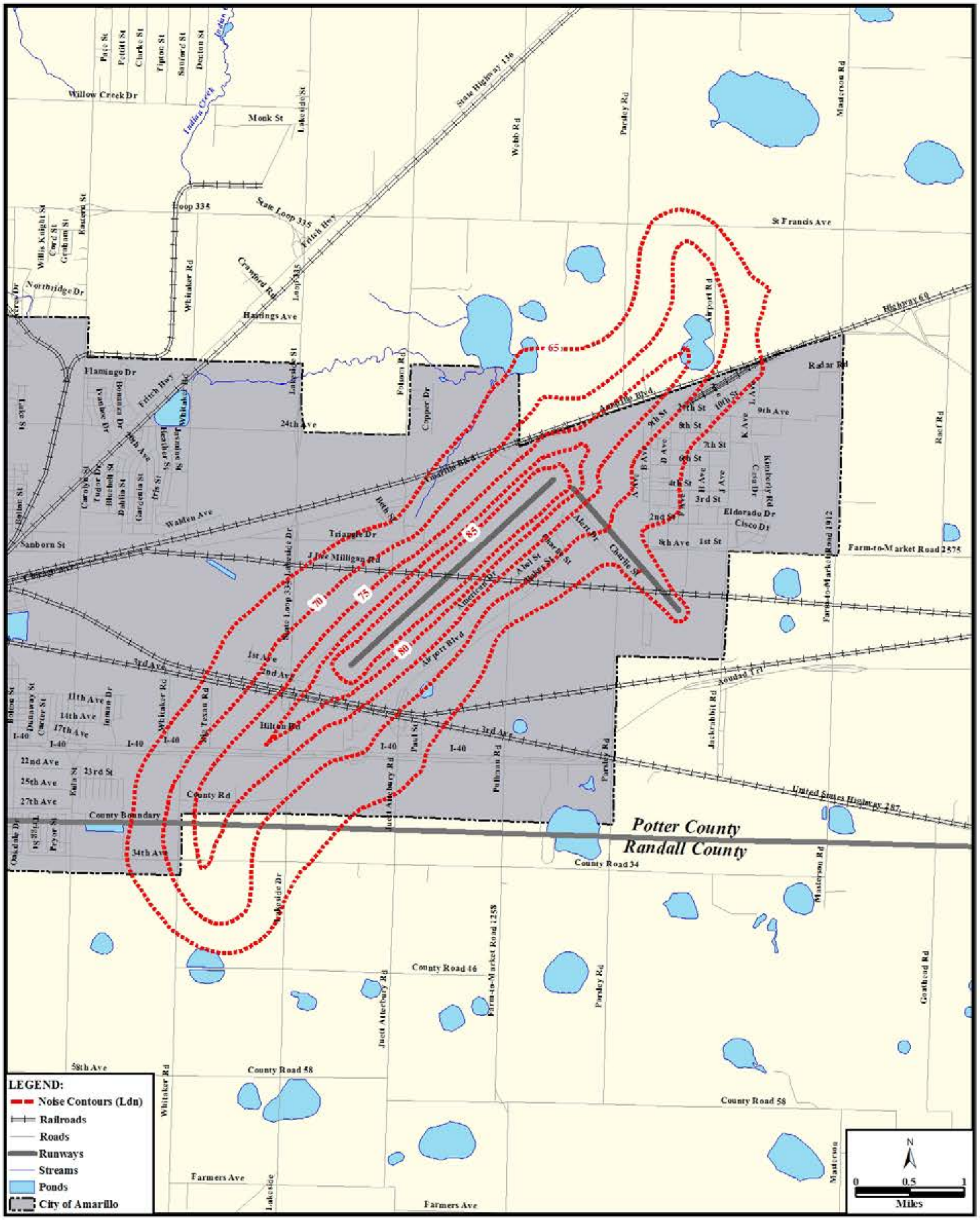


Figure 4-15 Noise Contours, End-State Condition, Proposed Action, Amarillo International Airport

Under the proposed action peak condition, land areas and population exposed to elevated noise levels, and the estimated numbers of persons expected to be highly annoyed increase. Under this condition, an additional 286 people become exposed to elevated noise levels, 48 of which would be expected to be highly annoyed. These increases are due to the increased number of closed pattern operations flown by Altus-based aircraft. Also, night closed pattern operations are proposed to be introduced while there were none under baseline conditions.

Under the proposed action end-state, however, the opposite is true. Land areas and population exposed are decreased 13 and 23 percent, respectively, from baseline levels. At the end-state, the number of persons expected to be highly annoyed is also reduced by 19 percent from baseline levels, and no people are exposed to noise levels greater than 80 L_{dn}. These reductions result from the cessation of C-5 aircraft operations.

Under the proposed action peak condition at Amarillo IAP, L_{dn} increases are relatively slight, ranging from 0 to 8.3 dB. In the end-state at Amarillo IAP, L_{dn} decreases at all locations. Decreases range from 0.3 to 4.5 dB.

4.6.1.2 Alternative Action

Under the alternative action, approximately 336 daily aviation operations would be conducted from Amarillo IAP during the peak condition, and approximately 311 daily operations would be conducted in the end-state condition. Operations during the peak condition represent an approximate 12 percent increase over baseline, while operations at the end-state represent an approximate 4 percent increase over the approximate 300 baseline operations. These operations are shown in Tables 4-46 and 4-47.

Table 4-46 Average Daily Operations, Peak Condition, Alternative Action, Amarillo International Airport

	Arrivals		Departures		Closed Patterns	
Aircraft	Day	Night	Day	Night	Day	Night
Air Carrier	12.409	0.792	12.409	0.792	0.000	0.000
Air Taxi	20.307	0.846	20.307	0.846	0.000	0.000
Gen. Aviation	31.283	0.639	31.283	0.639	4.966	0.000
C-5	3.802	0.038	3.802	0.038	9.380	0.119
C-17	0.000	0.000	0.000	0.000	7.973	3.099
KC-135R	9.504	0.096	9.504	0.096	9.838	1.952
Other Military	24.711	0.250	24.711	0.250	26.234	0.000
Total	**102.016**	**2.661**	102.016	2.661	58.391	5.170

Note: Daily operations are based on averages of annual operations; therefore, numbers do not round.

Table 4-47 Average Daily Operations, End-State Condition, Alternative Action, Amarillo International Airport

Aircraft	Arrivals		Departures		Closed Patterns	
	Day	Night	Day	Night	Day	Night
Air Carrier	12.409	0.792	12.409	0.792	0.000	0.000
Air Taxi	20.307	0.846	20.307	0.846	0.000	0.000
Gen. Aviation	31.283	0.639	31.283	0.639	4.966	0.000
C-17	0.000	0.000	0.000	0.000	0.000	0.000
KC-135R	9.504	0.096	9.504	0.096	19.667	3.901
Other Military	24.711	0.250	24.711	0.250	26.234	0.000
Total	**98.214**	**2.623**	98.214	2.623	50.867	3.901

Note: Daily operations are based on averages of annual operations; therefore, numbers do not round.

The noise contours resulting from these changed operations are illustrated in Figures 4-16 and 4-17, and the land areas exposed to elevated noise levels are compared with current conditions in Tables 4-48 and 4-49.

Table 4-48 Change in Land Areas Exposed To Indicated Sound Levels, Peak Condition, Alternative Action, Amarillo International Airport

Condition	**Day-Night Average Noise Level (L_{dn}dBA)**					
	65-70	**70-75**	**75-80**	**80-85**	**85+**	**Total**
Acres						
Baseline	5,206.7	2,697.8	1,378.0	525.7	511.7	**10,319.9**
Proposed Peak	5,674.3	2,821.7	1,434.7	585.7	539.6	**11,056.0**
Change	467.6	123.9	56.7	59.9	27.9	**736.0**
Population						
Baseline	113	36	15	1	0	**165**
Proposed Peak	396	36	16	2	0	**450**
Change	283	0	1	1	0	**285**
Persons Annoyed[1]						
Baseline	19	10	7	1	0	**37**
Proposed Peak	67	10	7	1	0	**85**
Change	48	0	0	0	0	**48**

Source: NOISEMAP; USCB 2002
[1] - Estimated based on average annoyance levels for indicated exposure.

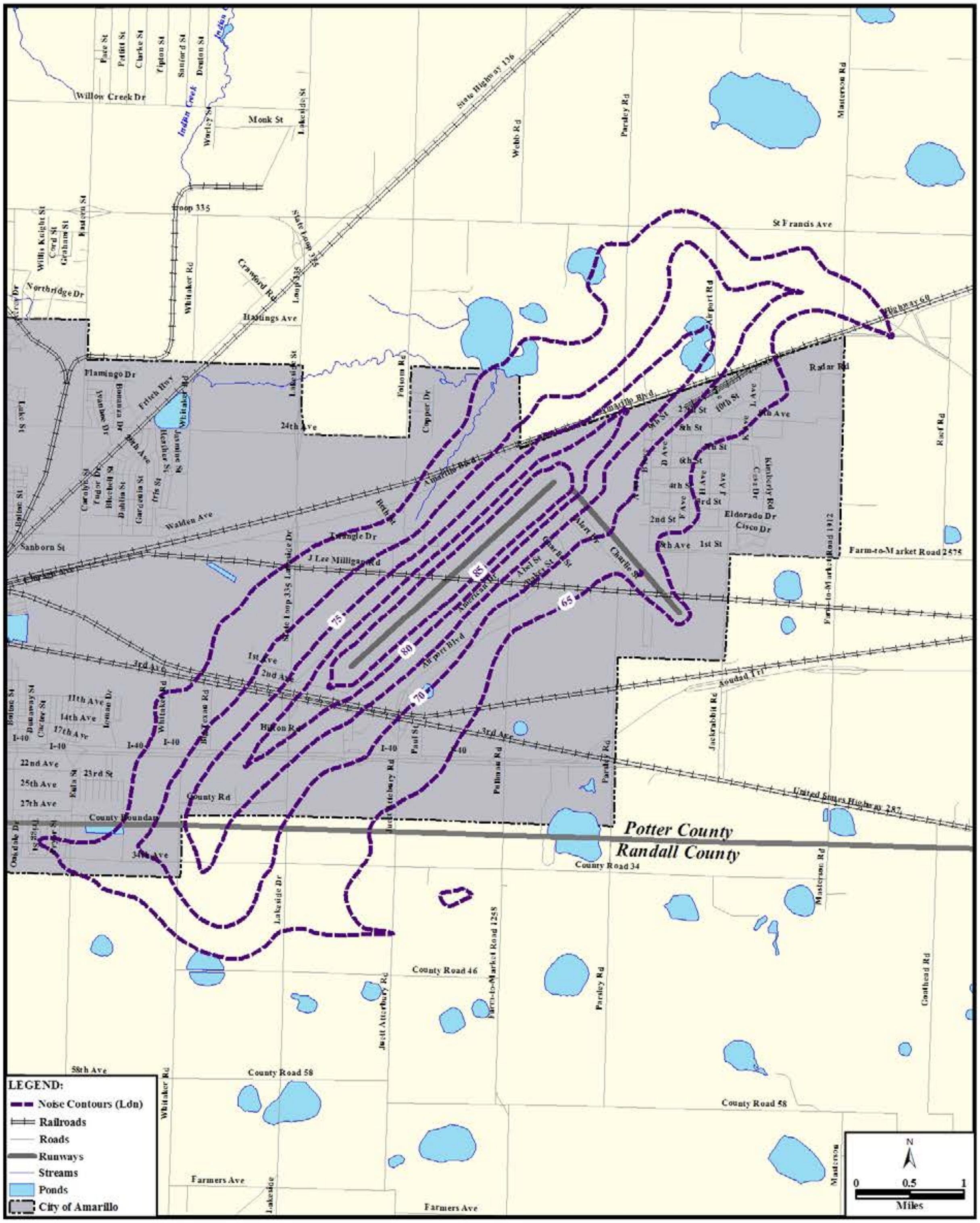


Figure 4-16 Noise Contours, Peak Condition, Alternative Action, Amarillo International Airport

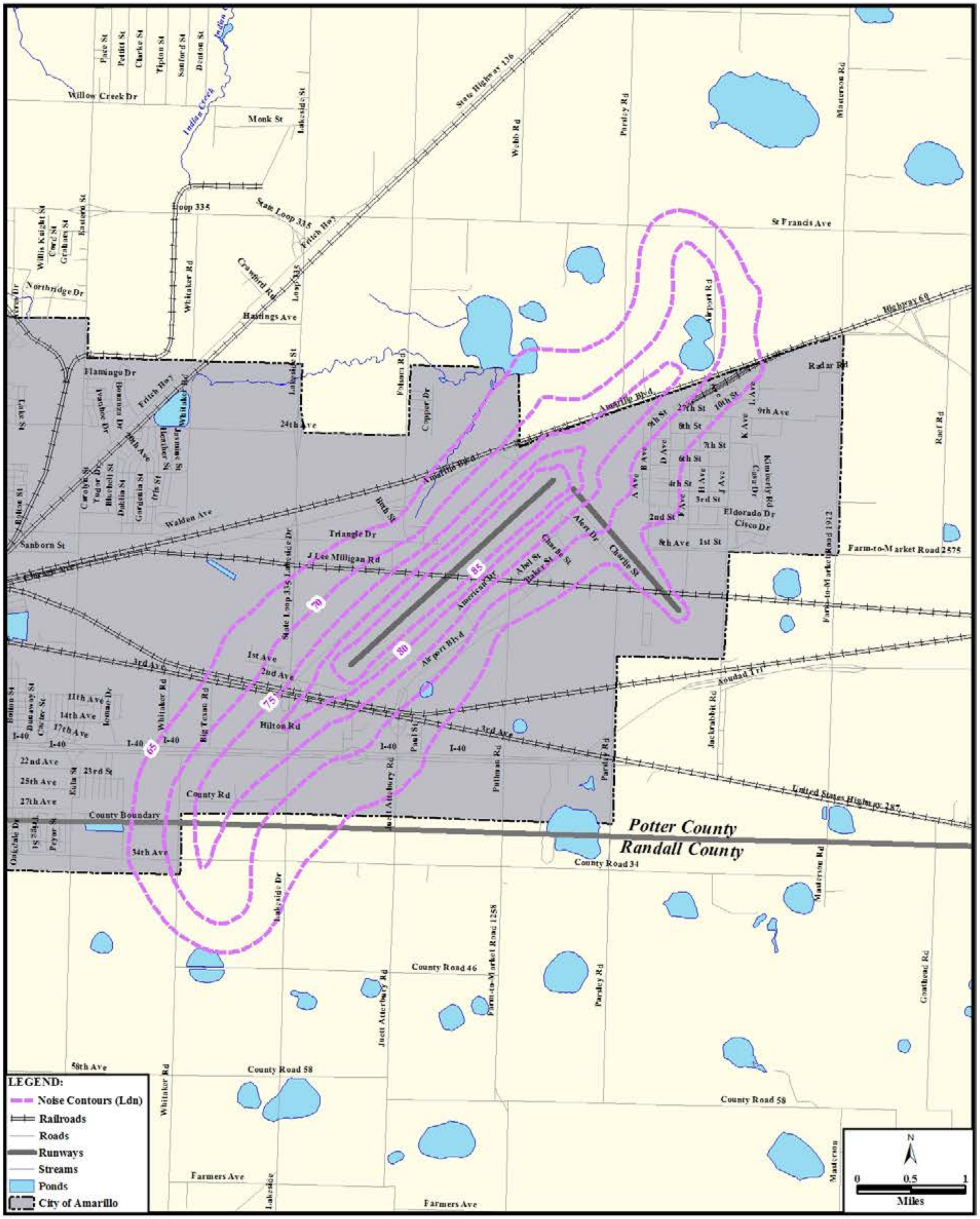


Figure 4-17 Noise Contours, End-State Condition, Alternative Action, Amarillo International Airport

Table 4-49 Change in Land Areas Exposed To Indicated Sound Levels, End-State Condition, Alternative Action, Amarillo International Airport

Condition	Day-Night Average Noise Level (L_{dn}dBA)					
	65-70	**70-75**	**75-80**	**80-85**	**85+**	**Total**
Acres						
Baseline	5,206.7	2,697.8	1,378.0	525.7	511.7	**10,319.9**
Proposed End	4,161.7	2,561.2	1,276.8	450.7	486.2.	**8,936.6**
Change	-1,045.0	-136.6	-101.2	-75.0	-25.5	**-1,383.3**
Population						
Baseline	113	36	15	1	0	**165**
Proposed End	77	34	14	1	0	**126**
Change	-36	-2	-1	0	0	**-39**
Persons Annoyed[1]						
Baseline	19	10	7	1	0	**37**
Proposed End	13	10	6	1	0	**30**
Change	-6	0	-1	0	0	**-7**

Source: NOISEMAP; USCB 2002
[1] - Estimated based on average annoyance levels for indicated exposure.

Under the alternative action peak condition, land areas and population exposed to elevated noise levels, and the estimated numbers of persons expected to be highly annoyed increase. Under this condition, an additional 285 people become exposed to elevated noise levels, 48 of which would be expected to be highly annoyed. These increases are due to the increased number of closed pattern operations flown by Altus-based aircraft. Also, night closed pattern operations are proposed to be introduced while there were none under baseline conditions.

Under the alternative action end-state, however, the opposite is true. Land areas and population exposed are decreased 13 and 24 percent, respectively, from baseline levels. At the end-state, the number of persons expected to be highly annoyed is also reduced by 19 percent from baseline levels, and no people are exposed to noise levels greater than 80 L_{dn}. This reduced exposure results from the cessation of Altus-based C-5 and C-17 aircraft operations

Under the alternative action peak condition at Amarillo IAP, L_{dn} increases are relatively slight, ranging from 0 to 8.2 dB. In the end-state at Amarillo IAP, L_{dn} decreases at all locations. Decreases range from 0.2 to 4.5 dB.

4.6.1.3 No-Action Alternative

Under the no-action alternative, there would be no change from the baseline conditions described in Section 3.3.2.

4.6.1.4 Cumulative Impacts

No additional actions have been announced for Amarillo IAP. Under the proposed and alternative actions, the acreage and the number of people exposed to excessive noise would be reduced. Therefore, cumulative impacts would not occur.

4.6.1.5 Mitigative Actions

Existing baseline noise levels at Amarillo IAP would be decreased from the implementation of the proposed action. Therefore, mitigation would not be required.

4.6.2 Air Quality

Criteria to determine the significance of air quality impacts and definition of major air emissions source(s) are discussed in Section 4.3.2.

4.6.2.1 Proposed Action

As part of the proposed action some of the redistribution of aircraft operations discussed in 4.3.2.1 would occur at Amarillo IAP. Projected aircraft emissions were calculated using the same emission factors, flight profiles, power settings, and calculation methods as outlined in Section 4.3.2.1 for Altus AFB. Data representing the changes in operations at Amarillo IAP for the peak year and end-state conditions are presented in Table 4-50. There is no predicted increase in indirect emissions associated with this location.

Table 4-50 Change in Aircraft Emissions from Peak Year and End Year Transition Training, Proposed Action, Amarillo International Airport

Location	Annual Emissions Increase (Tons/Year)				
	CO	VOC	NO_x	SO_x	PM_{10}
Amarillo IAP (Peak Condition)	-237.2	-23.3	3.2	-10.5	-48.2
Amarillo IAP (End-State Condition)	-232.6	-26.0	-116.0	-15.6	-51.3

Table 4-50 shows changes in aircraft emissions that would be expected to occur as a result of the implementation of the proposed action at Amarillo IAP. However, air quality impacts are considered by AQCR. Amarillo IAP and Lubbock IAP are both located within AQCR 211. In addition, portions of all MTRs are located within the boundaries of AQCR 211. Detailed calculations were performed to estimate the fraction of the total increase in emissions from the aircraft activities along those MTRs (see Table 4-12) that could potentially impact the air quality of AQCR 211. No increase in manpower loading would occur within AQCR 211. Table 4-51 presents the total change in emissions for AQCR 211, for both the peak and end state conditions under the proposed action.

Table 4-51 Change in Total Operational Emissions for Air Quality Control Region 211, Proposed Action (Amarillo and Lubbock International Airports, and Military Training Routes)

AQCR	Change in Annual Emissions (tons/year)				
	CO	VOC	NOx	SO_x	PM
Peak Condition					
211	-273.8	-24.7	296.9	0.4	-43.0
End-State Condition					
211	-269.3	-27.3	177.7	-4.7	-46.1

As shown on Table 4-51, the increase in emissions of NO_x in the air basin surrounding Amarillo and Lubbock IAPs during the peak condition (FY 05) would exceed the USEPA PSD criteria of 250 tpy. Increases for all other pollutants would remain below the threshold. However, in subsequent years, primarily driven by the reduction in C-5 aircraft operations, the increase in emissions for all pollutants of concern as compared to the baseline conditions would not exceed these criteria. Therefore, the changes in operations under the end-state condition of the proposed action are not predicted to impact air quality in AQCR 211.

4.6.2.2 Alternative Action

Under the alternative action, some of the aircraft operations assigned to Altus AFB would be redistributed to Amarillo IAP. To assess air quality impacts to the air basin surrounding Amarillo IAP resulting from the implementation of the alternative action, changes in emissions within AQCR 211 from all sources at each airfield must be considered. A summary of the change in criteria air pollutant emissions for AQCR 211 under both the peak and end-state condition for the alternative action is shown on Table 4-52.

Table 4-52 Change in Total Operational Emissions for Air Quality Control Region 211, Alternative Action (Amarillo and Lubbock International Airports and Military Training Routes)

AQCR	Change in Annual Emissions (tons/year)				
	CO	VOC	NOx	SO_x	PM
Peak Condition					
211	-283.9	-24.8	268.8	-4.1	-46.3
End-State Condition					
211	-282.5	-28.3	68.8	-15.6	-64.6

As shown on Table 4-52, the increase in emissions of NO_x in the air basin surrounding Amarillo IAP and Lubbock IAP during the peak condition would exceed the USEPA PSD criteria of 250 tpy. Increases for all other pollutants would remain below the threshold. However, in the end-state condition, the increase in emissions for all pollutants of concern as compared to the baseline conditions would not exceed these criteria. Therefore, the changes in operations under the end-state condition of the alternative action are not predicted to impact air quality in AQCR 211.

4.6.2.3 No-Action Alternative

Under the no-action alternative, the baseline operating conditions, and the resultant levels of air pollutant emissions, would continue. Therefore the air quality, as described in Section 3.4.3.3, would not be impacted by this alternative.

4.6.2.4 Cumulative Impacts

Amarillo IAP is a commercially owned airstrip, at which the military shares usage of the airspace and facilities with non-military users. The Air Force did not identify any additional projects planned at Amarillo IAP. It should be noted that implementation of the proposed and alternative actions is not predicted to have any long-term impacts to regional air quality.

4.6.2.5 Mitigative Actions

Mitigation measures to protect human health and welfare would not be required, since the implementation of the proposed and alternative actions would not result in impacts to regional air quality.

4.7 DESCRIPTION OF THE EFFECTS OF ALL ALTERNATIVES ON THE AFFECTED ENVIRONMENT FOR LUBBOCK INTERNATIONAL AIRPORT

The scope of the proposed action and alternatives at Lubbock IAP is limited to aircraft training operations. As a result only those resources areas that have a potential to be impacted by the proposed action and alternatives are addressed in the following sections. The resources areas analyzed but not discussed include: earth resources, water resources, hazardous materials and wastes, biological resources, cultural resources, and socioeconomics.

4.7.1 Noise

4.7.1.1 Proposed Action

Factors considered in noise analysis around airfields and input requirements for the Air Force's BASEOPS/NOISEMAP model were discussed in Section 3.1.2. Under the proposed action, approximately 246 daily aviation operations would be conducted at Lubbock IAP, a decrease of less than 1 percent from the approximate 248 baseline operations. These levels of operations do not change between the peak and end-state

conditions since no C-5 operations were, or would be supported by the airport. These operations are shown in Table 4-53.

Table 4-53 Average Daily Operations, Proposed Action, Lubbock International Airport

Aircraft	Arrivals		Departures		Closed Patterns	
	Day	Night	Day	Night	Day	Night
Air Carrier	18.836	1.638	18.836	1.638	0.000	0.000
Air Taxi	26.582	2.311	26.582	2.311	0.000	0.000
Gen. Aviation	22.874	1.989	22.874	1.989	17.196	0.000
C-17	0.878	0.076	0.878	0.076	0.996	0.388
KC-135	1.755	0.153	1.755	0.153	0.000	0.000
Other Military	14.920	1.297	14.920	1.297	11.134	0.000
Total	**85.845**	**7.464**	**85.845**	**7.464**	**29.326**	**0.388**

Note: Daily operations are based on averages of annual operations; therefore, numbers do not round.
[1] - Since closed patterns are essentially an arrival and takeoff, the 29.714 closed patterns shown equate to 59.428 aviation operations

The noise contours resulting from these changed operations are illustrated in Figure 4-18, and the land areas exposed to elevated noise levels are compared with current conditions in Table 4-54.

Table 4-54 Change in Land Areas Exposed to Indicated Sound Levels, Proposed Action, Lubbock International Airport

Condition	Day-Night Average Noise Level (L_{dn}dBA)					
	65-70	70-75	75-80	80-85	85+	Total
Acres						
Baseline	1,602.0	738.8	329.5	171.6	45.6	**2,887.5**
Proposed Peak	1,619.6	771.2	331.8	173.2	46.6	**2,942.4**
Change	17.6	32.4	2.3	1.6	1.0	**54.9**
Population						
Baseline	545	1	0	0	0	**546**
Proposed Peak	546	3	0	0	0	**549**
Change	1	2	0	0	0	**3**
Persons Annoyed[1]						
Baseline	93	0	0	0	0	**93**
Proposed Peak	93	1	0	0	0	**94**
Change	0	1	0	0	0	**1**

Source: NOISEMAP; USCB 2002
[1] - Estimated based on average annoyance levels for indicated exposure.

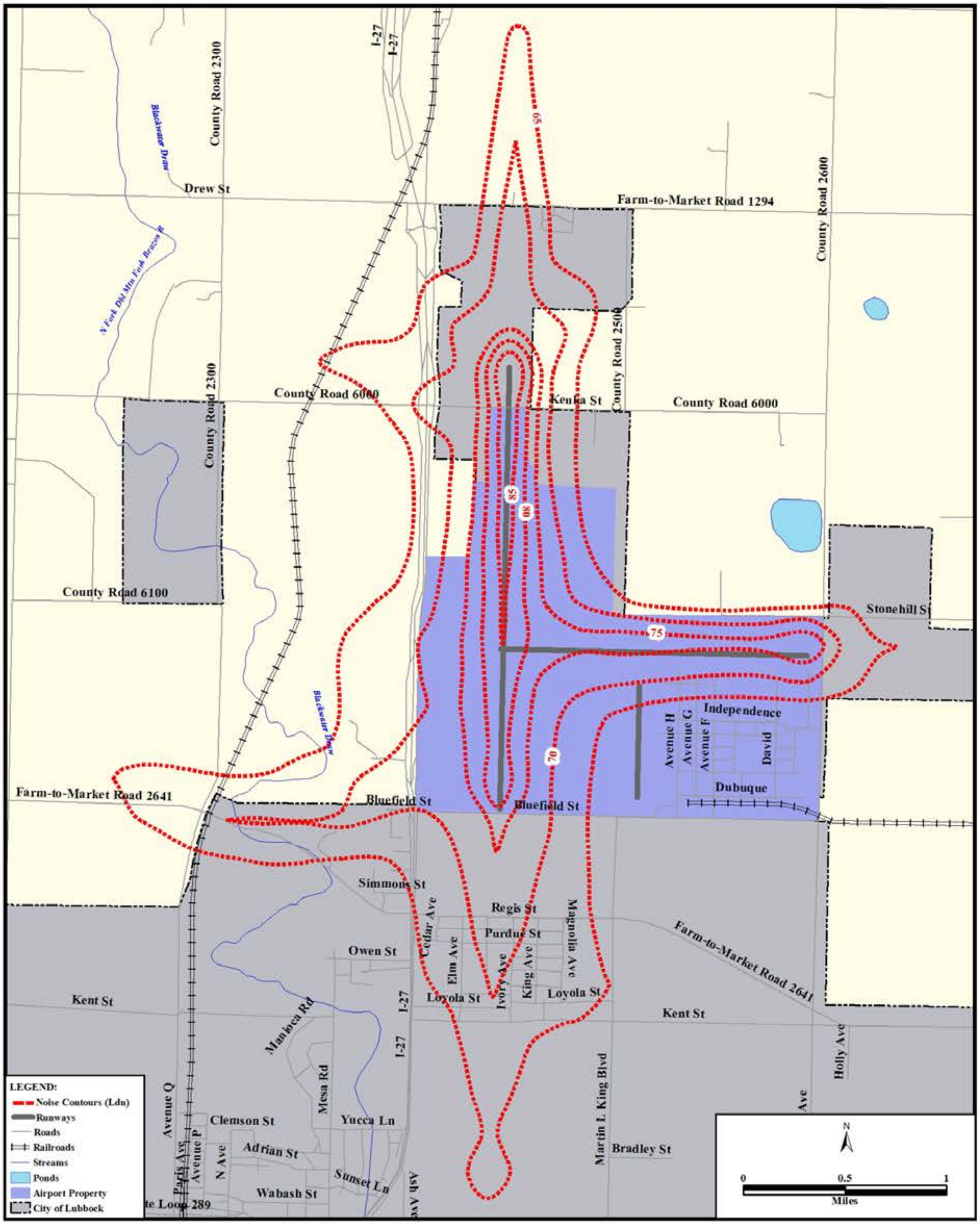


Figure 4-18 Noise Contours, Proposed Action, Lubbock International Airport

Under the proposed action peak and end-state conditions, land areas and population exposed to elevated noise levels, and the estimated numbers of persons expected to be highly annoyed reflect minimal increases. Under this condition, only three additional people become exposed to elevated noise levels, one of which would be expected to be highly annoyed. Of all persons exposed to elevated noise levels, none experience levels greater than L_{dn} 75. These slight impacts result from the relatively limited number of operations proposed to be conducted by Altus-based C-17 aircraft.

4.7.1.2 Alternative Action

There is no change from the alternative action for either the peak or end-state of this alternative. Noise impacts associated with operations at Lubbock IAP under this alternative are the same as described in Section 4.7.1.1.

4.7.1.3 No-Action Alternative

Under the no-action alternative, there would be no change from the baseline conditions described in Section 3.5.1.

4.7.1.4 Cumulative Impacts

No additional actions have been announced for Lubbock IAP. Under the proposed and alternative actions, the number of people exposed to excessive noise would be increased by a maximum of 40 individuals over baseline conditions (546 individuals).

4.7.1.5 Mitigative Actions

Existing baseline noise levels at Lubbock IAP would be increased from the implementation of the proposed action. Under the proposed and alternative actions, an additional 40 individuals would be exposed to elevated noise levels over baseline conditions (546 individuals).

4.7.2 Air Quality

Criteria to determine the significance of air quality impacts and definition of major air emissions source(s) are discussed in Section 4.3.2.

4.7.2.1 Proposed Action

As part of the proposed action some of the redistribution of aircraft operations discussed in 4.3.2.1 would occur at Lubbock IAP. Projected aircraft emissions were calculated using the same emission factors, flight profiles, power settings, and calculation methods as outlined in Section 4.3.2.1 for Altus AFB. Changes in emission resulting from operations at Lubbock IAP under the proposed action are presented in Table 4-55. There is no predicted increase in indirect emissions associated with this location.

Table 4-55 Change in Aircraft Emissions from Transition Training, Proposed Action, Lubbock International Airport

Location	Annual Emissions Increase (Tons/Year)				
	CO	VOC	NO_x	SO_x	PM_{10}
Lubbock IAP	-43.3	-1.7	-23.8	-4.8	-16.2

For evaluation of regional impacts, these emissions are combined with emissions from Amarillo IAP and the MTRs, and presented as net changes in air emissions for AQCR 211 under the proposed action as discussed in Section 4.6.2.1 for Amarillo IAP.

4.7.2.2 Alternative Action

Under the alternative action, some of the aircraft operations assigned to Altus AFB would be redistributed to Lubbock IAP. Aircraft emission increases/decreases would be expected to result from the implementation of the alternative action at Lubbock IAP. For evaluation of regional impacts, these emissions are combined with emissions from Amarillo IAP and the MTRs, and presented as net changes in air emissions for AQCR 211 under the alternative action as discussed in Section 4.6.2.2.

4.7.2.3 No-Action Alternative

Under the no-action alternative, the baseline operating conditions, and the resultant levels of air pollutant emissions, would continue. Therefore the air quality, as described in Section 3.5.3.3, would not be impacted by this alternative.

4.7.2.4 Cumulative Impacts

Mitigation measures to protect human health and welfare would not be required, since the implementation of the proposed and alternative actions would not result in impacts to regional air quality.

4.7.2.5 Mitigative Actions

Mitigation measures to protect human health and welfare would not be required, since the implementation of the proposed and alternative actions would not result in impacts to regional air quality.

4.8 CUMULATIVE IMPACTS

Cumulative impact, as defined by the CEQ (40CFR 1508.7), is the "impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of which agency (federal or non-federal) or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time." In the preceding sections, cumulative impacts were addressed by location and topic.

Analysis of the past, present, and reasonably foreseeable future actions in the ROI with regard to Altus AFB indicate the projects analyzed will contribute to a reduction in noise for approximately 16,500 acres of land. If there is an expansion to Sooner DZ and construction of an ALZ, there will be cumulative noise impacts. However, the anticipated impact would affect only four individuals (as well as their livestock) and easements are anticipated. Minimal cumulative impact with regard to noise at CSIA is expected as a result of the construction of the Oklahoma Spaceport. With regard to Amarillo IAP, there will be a decrease in noise for approximately 895 acres; however, no other projects in the ROI were identified and hence the cumulative impact is not quantifiable. With regard to Lubbock IAP, there is a slight increase in noise but no other actions were identified as occurring in the ROI which would contribute to cumulative impacts. Due to the lack of direct and indirect impact in other topics locations analyzed in this EA, we do not anticipate adverse synergistic impacts.

CHAPTER 5

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CHAPTER 6

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CHAPTER 7

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APPENDIX A

NOISE ANALYSIS

Noise is generally described as unwanted sound. Unwanted sound can be based on objective effects (such as hearing loss or damage to structures) or subjective judgments (community annoyance). Noise analysis thus requires a combination of physical measurement of sound, physical and physiological effects, plus psycho- and socio-acoustic effects.

Section 1 of this appendix describes how sound is measured and summarizes noise impact in terms of community acceptability and land use compatibility. Section 2 gives detailed descriptions of the effects of noise that lead to the impact guidelines presented in section 1. Section 3 provides a description of the specific methods used to predict aircraft noise.

1.0 NOISE DESCRIPTORS AND IMPACT

Aircraft operating in the MOAs and Warning Areas generate two types of sound. One is "subsonic" noise, which is continuous sound generated by the aircraft's engines and also by air flowing over the aircraft itself. The other is sonic booms (only in MOAs and Warning Areas authorized for supersonic), which are transient impulsive sounds generated during supersonic flight. These are quantified in different ways.

Section 1.1 describes the characteristics which are used to describe sound. Section 1.2 describes the specific noise metrics used for noise impact analysis. Section 1.3 describes how environmental impact and land use compatibility are judged in terms of these quantities.

1.1 Quantifying Sound

Measurement and perception of sound involves two basic physical characteristics: amplitude and frequency. Amplitude is a measure of the strength of the sound and is directly measured in terms of the pressure of a sound wave. Because sound pressure varies in time, various types of pressure averages are usually used. Frequency, commonly perceived as pitch, is the number of times per second the sound causes air molecules to oscillate. Frequency is measured in units of cycles per second, or hertz (Hz).

Amplitude. The loudest sounds the human ear can comfortably hear have acoustic energy one trillion times the acoustic energy of sounds the ear can barely detect. Because of this vast range, attempts to represent sound amplitude by pressure are generally unwieldy. Sound is, therefore, usually represented on a logarithmic scale with a unit called the decibel (dB). Sound on the decibel scale is referred to as a sound level. The threshold of human hearing is approximately 0 dB, and the threshold of discomfort or pain is around 120 dB.

Because of the logarithmic nature of the decibel scale, sound levels do not add and subtract directly and are somewhat cumbersome to handle mathematically. However, some simple rules of thumb are useful in dealing with sound levels. First, if a sound's intensity is doubled, the sound level increases by 3 dB, regardless of the initial sound level. Thus, for example:

60 dB + 60 dB = 63 dB, and

80 dB + 80 dB = 83 dB.

The total sound level produced by two sounds of different levels is usually only slightly more than the higher of the two. For example:

$$60.0 \text{ dB} + 70.0 \text{ dB} = 70.4 \text{ dB}.$$

Because the addition of sound levels behaves differently than that of ordinary numbers, such addition is often referred to as "decibel addition" or "energy addition." The latter term arises from the fact that the combination of decibel values consists in first converting each decibel value to its corresponding acoustic energy, then adding the energies using the normal rules of addition, and finally converting the total energy back to its decibel equivalent.

The difference in dB between two sounds represents the ratio of the amplitudes of those two sounds. Because human senses tend to be proportional (i.e., detect whether one sound is twice as big as another) rather than absolute (i.e., detect whether one sound is a given number of pressure units bigger than another), the decibel scale correlates well with human response.

Under laboratory conditions, differences in sound level of 1 dB can be detected by the human ear. In the community, the smallest change in noise level that can normally be detected is about 3 dB. A change in sound level of about 10 dB is usually perceived by the average person as a doubling (or halving) of the sound's loudness, and this relation holds true for loud sounds and for quieter sounds. A decrease in sound level of 10 dB actually represents a 90 percent decrease in sound <u>intensity</u> but only a 50 percent decrease in perceived <u>loudness</u> because of the nonlinear response of the human ear (similar to most human senses).

Frequency. The normal human ear can hear frequencies from about 20 Hz to about 20,000 Hz. It is most sensitive to sounds in the 1,000 to 4,000 Hz range. When measuring community response to noise, it is common to adjust the level of the measured sound to correspond to the frequency sensitivity of the human ear. This adjustment is called A-weighting (ANSI 1988). Sound levels that have been so adjusted are referred to as A-weighted sound levels. The amplitude of A-weighted sound levels is measured in dB. It is common for some noise analysts to denote the unit of A-weighted sounds by dBA or dB(A). As long as the use of A-weighting is understood, there is no difference between dB, dBA or dB(A). It is only important that the use of A-weighting be made clear. In this study, sound levels are reported in dB and are A-weighted unless otherwise specified.

A-weighting is appropriate for continuous sounds, which are perceived by the ear. Impulsive sounds, such as sonic booms, are perceived by more than just the ear. When experienced indoors, there can be secondary noise from rattling of the building. Vibrations may also be felt. C-weighting (ANSI 1988) is applied to such sounds. This is a frequency weighting that is relatively flat over the range of human hearing (about 20 Hz to 20,000 Hz) and rolls off above and below that range. In this study, C-weighted sound levels are used for the assessment of sonic booms and other impulsive sounds. As with A-weighting, the unit is dB, but dBC or dB(C) are sometimes used. In this study, sound levels are reported in dB, and C-weighting is specified as necessary.

Time Averaging. Sound pressure of a continuous sound varies greatly with time, so it is customary to deal with sound levels that represent averages over time. Levels presented as

instantaneous (i.e., as might be read from the dial of a sound level meter) are based on averages of sound energy over either 1/8 second (fast) or 1 second (slow). The formal definitions of fast and slow levels are somewhat complex, with details that are important to the makers and users of instrumentation. They may, however, be thought of as levels corresponding to the root-mean-square sound pressure measured over the 1/8-second or 1-second periods.

The most common uses of the fast or slow sound level in environmental analysis is in the discussion of the maximum sound level that occurs from the action, and in discussions of typical sound levels. Figure B-1 is a chart of A-weighted sound levels from typical sounds. Some (air conditioner, vacuum cleaner) are continuous sounds whose levels are constant for some time. Some (automobile, heavy truck) are the maximum sound during a vehicle passby. Some (urban daytime, urban nighttime) are averages over some extended period. A variety of noise metrics have been developed to describe noise over different time periods. These are described in section 1.2.

1.2 Noise Metrics

Maximum Sound Level

The highest A-weighted sound level measured during a single event in which the sound level changes value as time goes on (e.g., an aircraft overflight) is called the maximum A-weighted sound level or maximum sound level, for short. It is usually abbreviated by ALM, L_{max}, or L_{Amax}. The maximum sound level is important in judging the interference caused by a noise event with conversation, TV or radio listening, sleeping, or other common activities.

Peak Sound Level

For impulsive sounds, the true instantaneous sound pressure is of interest. For sonic booms, this is the peak pressure of the shock wave, as described in section 3.2 of this appendix. This pressure is usually presented in physical units of pounds per square foot. Sometimes it is represented on the decibel scale, with symbol L_{pk}. Peak sound levels do not use either A or C weighting.

Sound Exposure Level

Individual time-varying noise events have two main characteristics: a sound level that changes throughout the event and a period of time during which the event is heard. Although the maximum sound level, described above, provides some measure of the intrusiveness of the event, it alone does not completely describe the total event. The period of time during which the sound is heard is also significant. The Sound Exposure Level (abbreviated SEL or L_{AE} for A-weighted sounds) combines both of these characteristics into a single metric.

SEL is a composite metric that represents both the intensity of a sound and its duration. Mathematically, the mean square sound pressure is computed over the duration of the event, then multiplied by the duration in seconds, and the resultant product is turned into a sound level. It does not directly represent the sound level heard at any given time, but rather provides a measure of the net impact of the entire acoustic event. It has been well established in the scientific community that SEL measures this impact much more reliably than just the maximum sound level.

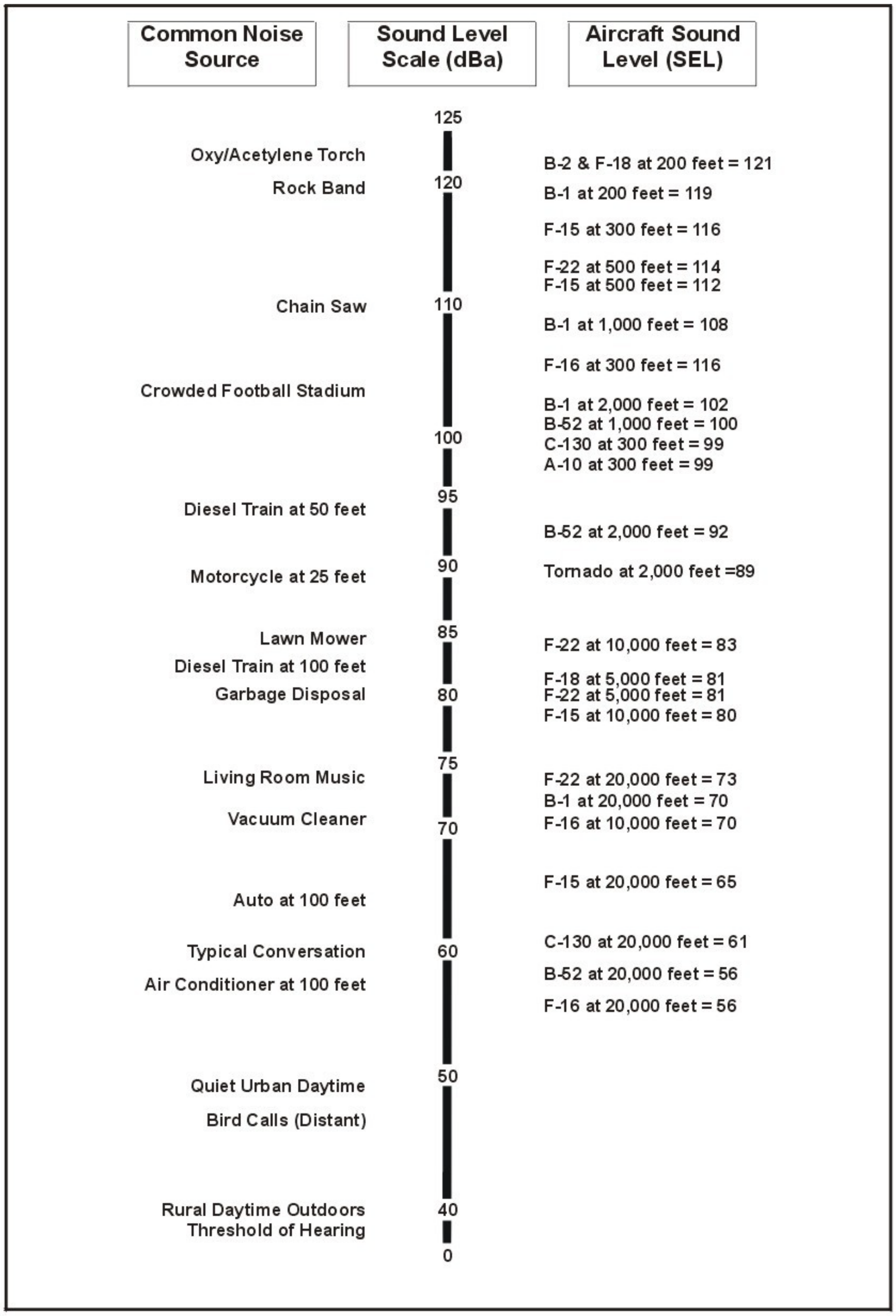


Figure B-1. Typical A-Weighted Sound Levels of Common Sounds

Because the SEL and the maximum sound level are both used to describe single events, there is sometimes confusion between the two, so the specific metric used should be clearly stated.

SEL can be computed for C-weighted levels (appropriate for impulsive sounds), and the results denoted CSEL or L_{CE}. SEL for A-weighted sound is sometimes denoted ASEL. Within this study, SEL is used for A-weighted sounds and CSEL for C-weighted.

Equivalent Sound Level

For longer periods of time, total sound is represented by the equivalent continuous sound pressure level (L_{eq}). L_{eq} is the average sound level over some time period (often an hour or a day, but any explicit time span can be specified), with the averaging being done on the same energy basis as used for SEL. SEL and L_{eq} are closely related, differing by (a) whether they are applied over a specific time period or over an event, and (b) whether the duration of the event is included or divided out.

Just as SEL has proven to be a good measure of the noise impact of a single event, L_{eq} has been established to be a good measure of the impact of a series of events during a given time period. Also, while L_{eq} is defined as an average, it is effectively a sum over that time period and is, thus, a measure of the cumulative impact of noise.

Day-Night Average Sound Level

Noise tends to be more intrusive at night than during the day. This effect is accounted for by applying a 10-dB penalty to events that occur after 10 pm and before 7 am. If L_{eq} is computed over a 24-hour period with this nighttime penalty applied, the result is the day-night average sound level (DNL or L_{dn}). DNL is the community noise metric recommended by the USEPA (USEPA 1974) and has been adopted by most federal agencies (FICON 1992). It has been well established that DNL correlates well with community response to noise (Schultz 1978; Finegold *et al.* 1994). This correlation is presented in section 1.3 of the appendix.

While DNL carries the nomenclature "average," it incorporates all of the noise at a given location. For this reason, DNL is often referred to as a "cumulative" metric. It accounts for the total, or cumulative, noise impact.

It was noted earlier that, for impulsive sounds, C-weighting is more appropriate than A-weighting. The day-night average sound level can be computed for C-weighted noise and is denoted CDNL or L_{Cdn}. This procedure has been standardized, and impact interpretive criteria similar to those for DNL have been developed (CHABA 1981).

Onset-Rate Adjusted Monthly Day-Night Average Sound Level

Aircraft operations in military airspace, such as MTRs, MOAs and Warning Areas, generate a noise environment somewhat different from other community noise environments. Overflights are sporadic, occurring at random times and varying from day to day and week to week. This situation differs from most community noise environments, in which noise tends to be continuous or patterned. Individual military overflight events also differ from typical community noise events in that noise from a low-altitude, high-airspeed flyover can have a rather sudden onset.

To represent these differences, the conventional metrics are adjusted to account for the "surprise" effect of the sudden onset of aircraft noise events on humans (Plotkin *et al.* 1987; Stusnick *et al.* 1992; Stusnick *et al.* 1993). For aircraft exhibiting a rate of increase in sound level (called onset rate) of from 15 to 150 dB per second, an adjustment or penalty ranging from 0 to 11 dB is added to the normal SEL. Onset rates above 150 dB per second require a 11 dB penalty, while onset rates below 15 dB per second require no adjustment. The DNL is then determined in the same manner as for conventional aircraft noise events and is designated as Onset-Rate Adjusted Day-Night Average Sound Level (abbreviated L_{dnmr}). Because of the irregular occurrences of overflights along MTRs, the number of average daily operations is determined by using the calendar month with the highest number of operations. The monthly average is denoted L_{dnmr}.

1.3 Noise Impact

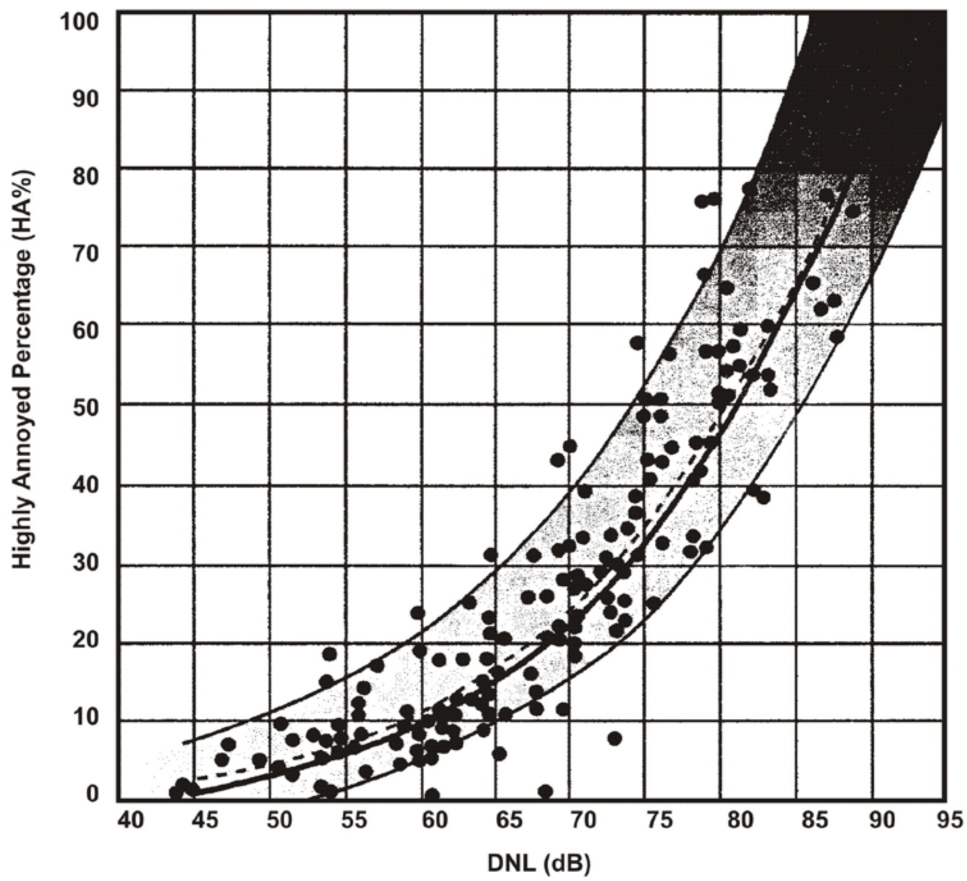
Community Reaction

Studies of community annoyance to numerous types of environmental noise show that DNL correlates well with impact. Schultz (1978) showed a consistent relationship between DNL and annoyance. Figure B-2 presents Shultz's original curve fit. This shows that there is a remarkable consistency in results of attitudinal surveys which relate the percentages of groups of people who express various degrees of annoyance when exposed to different DNLs.

A more recent study has reaffirmed this relationship (Fidell *et al.* 1991). Figure B-3 (FICON 1992) shows an updated form of the curve fit (Finegold *et al.* 1994) in comparison with the original. The updated fit, which does not differ substantially from the original, is the current preferred form. In general, correlation coefficients of 0.85 to 0.95 are found between the percentages of groups of people highly annoyed and the level of average noise exposure. The correlation coefficients for the annoyance of individuals are relatively low, however, on the order of 0.5 or less. This is not surprising, considering the varying personal factors that influence the manner in which individuals react to noise. Nevertheless, findings substantiate that community annoyance to aircraft noise is represented quite reliably using DNL.

As noted earlier for SEL, DNL does not represent the sound level heard at any particular time, but rather represents the total sound exposure. DNL accounts for the sound level of individual noise events, the duration of those events, and the number of events. Its use is endorsed by the scientific community (ANSI 1980; ANSI 1988; USEPA 1974; FICUN 1980; FICON 1992).

While DNL is the best metric for quantitatively assessing cumulative noise impact, it does not lend itself to intuitive interpretation by non-experts. Accordingly, it is common for environmental noise analyses to include other metrics for illustrative purposes. A general indication of the noise environment can be presented by noting the maximum sound levels which can occur and the number of times per day noise events will be loud enough to be heard. Use of other metrics as supplements to DNL has been endorsed by federal agencies (FICON 1992).



Source: Schultz, 1978

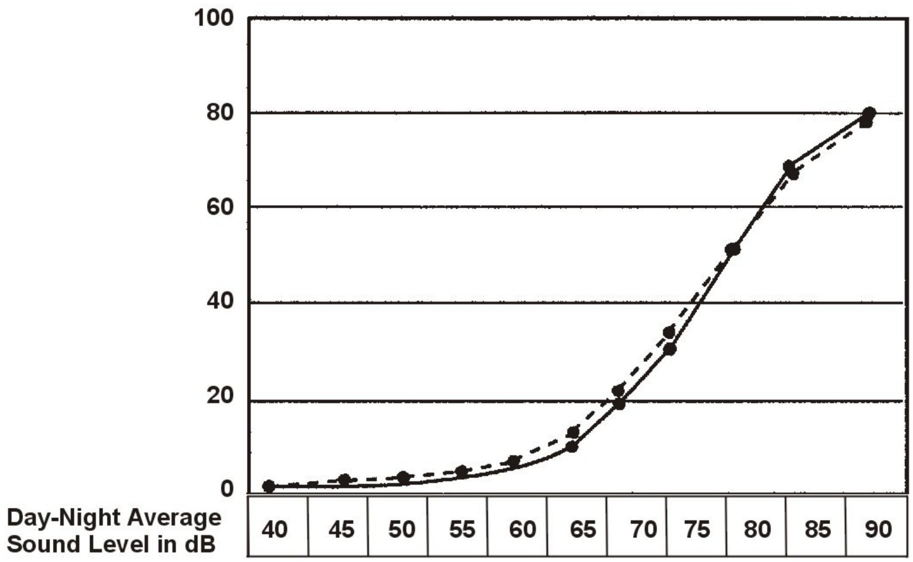
LEGEND

- - - - - $\%HA = 0.8553\ L_{dn} - 0.0401\ L_{dn}^2 + 0.00047\ L_{dn}^3$

——— All 161 Data Points Given Equal Weight

All Surveys Given Equal Weight

Figure B-2. Community Surveys of Noise Annoyance



Calculated % HA Points											
FINEGOLD	0.41	0.83	1.66	3.31	6.48	12.3	22.1	36.5	53.7	70.2	82.6
SCHULTZ	0.58	1.11	2.12	4.03	7.52	13.6	23.3	37.1	53.3	68.8	81

LEGEND

Finegold DATA 400 POINTS (Finegold *et al*. 1994)
% HA = 100/[1+EXP (11.13 - 0.141 LDN)]

SCHULTZ DATA 161 POINTS
% HA = 100/[1 + exp (10.43 - 0.132 LDN)]

HA = Highly Annoyed

Figure B-3. Response of Communities to Noise; Comparison of Original (Schultz 1978) and Current (Finegold et al. 1994) Curve Fits

The Schultz curve is generally applied to annual average DNL. In section 1.2, L_{dnmr} was described and presented as being appropriate for quantifying noise in military airspace. L_{dnmr} is always equal to or greater than DNL, so impact is generally higher than would have been predicted if the onset rate and busiest-month adjustments were not accounted for.

There are several points of interest in the noise-annoyance relation. The first is DNL of 65 dB. This is a level most commonly used for noise planning purposes and represents a compromise between community impact and the need for activities like aviation which do cause noise. Areas exposed to DNL above 65 dB are generally not considered suitable for residential use. The second is DNL of 55 dB, which was identified by USEPA as a level below which there is effectively no adverse impact (USEPA 1974). The third is DNL of 75 dB. This is the lowest level at which adverse health effects could be credible (USEPA 1974). The very high annoyance levels make such areas unsuitable for residential land use.

Sonic boom exposure is measured by C-weighting, with the corresponding cumulative metric being CDNL. Correlation between CDNL and annoyance has been established, based on community reaction to impulsive sounds (CHABA 1981). Values of the C-weighted equivalent to the Schultz curve are different than that of the Schultz curve itself. Table B-1 shows the relation between annoyance, DNL, and CDNL. Interpretation of CDNL from impulsive noise is accomplished by using the CDNL versus annoyance values in Table B-1. CDNL can be interpreted in terms of an "equivalent annoyance" DNL. For example, CDNL of 52, 61, and 69 dB are equivalent to DNL of 55, 65, and 75 dB, respectively. If both continuous and impulsive noise occur in the same area, impacts are assessed separately for each.

Table B-1. Relation Between Annoyance, DNL and CDNL

CDNL	***% Highly Annoyed***	***DNL***
48	2	50
52	4	55
57	8	60
61	14	65
65	23	70
69	35	75

Land Use Compatibility

As noted above, the inherent variability between individuals makes it impossible to predict accurately how any individual will react to a given noise event. Nevertheless, when a community is considered as a whole, its overall reaction to noise can be represented with a high degree of confidence. As described above, the best noise exposure metric for this correlation is

the DNL or L_{dnmr} for military overflights. Impulsive noise can be assessed by relating CDNL to an "equivalent annoyance" DNL, as outlined in section 1.3.

In June 1980, an ad hoc Federal Interagency Committee on Urban Noise (FICUN) published guidelines (FICUN 1980) relating DNL to compatible land uses. This committee was composed of representatives from DoD, Transportation, and Housing and Urban Development; USEPA; and the Veterans Administration. Since the issuance of these guidelines, federal agencies have generally adopted these guidelines for their noise analyses.

Following the lead of the committee, DoD and FAA adopted the concept of land-use compatibility as the accepted measure of aircraft noise effect. The FAA included the committee's guidelines in the Federal Aviation Regulations (USDOT 1984). These guidelines are reprinted in Table B-2, along with the explanatory notes included in the regulation. Although these guidelines are not mandatory (note the footnote "*" in the table), they provide the best means for determining noise impact in airport communities. In general, residential land uses normally are not compatible with outdoor DNL values above 65 dB, and the extent of land areas and populations exposed to DNL of 65 dB and higher provides the best means for assessing the noise impacts of alternative aircraft actions. In some cases, where noise change exceeds 3 dB, the 1992 FICON indicates the 60 dB DNL may be a more appropriate incompatibility level for densely populated areas.

2.0 NOISE EFFECTS

The discussion in section 1.3 presents the global effect of noise on communities. The following sections describe particular noise effects.

2.1 Hearing Loss

Noise-induced hearing loss is probably the best defined of the potential effects of human exposure to excessive noise. Federal workplace standards for protection from hearing loss allow a time-average level of 90 dB over an 8-hour work period, or 85 dB averaged over a 16-hour period. Even the most protective criterion (no measurable hearing loss for the most sensitive portion of the population at the ear's most sensitive frequency, 4,000 Hz, after a 40-year exposure) suggests a time-average sound level of 70 dB over a 24-hour period (USEPA 1974). Since it is unlikely that airport neighbors will remain outside their homes 24 hours per day for extended periods of time, there is little possibility of hearing loss below a DNL of 75 dB, and this level is extremely conservative.

2.2 Nonauditory Health Effects

Nonauditory health effects of long-term noise exposure, where noise may act as a risk factor, have not been found to occur at levels below those protective against noise-induced hearing loss, described above. Most studies attempting to clarify such health effects have found that noise exposure levels established for hearing protection will also protect against any potential nonauditory health effects, at least in workplace conditions. The best scientific summary of these findings is contained in the lead paper at the National Institutes of Health Conference on

Table B-2. Land-Use Compatibility With Yearly Day-Night Average Sound Levels

Land Use	Yearly Day-Night Average Sound Level (DNL) in Decibels					
	Below 65	65–70	70–75	75–80	80–85	Over 85
Residential						
Residential, other than mobile homes and transient lodgings	Y	N(1)	N(1)	N	N	N
Mobile home parks	Y	N	N	N	N	N
Transient lodgings	Y	N(1)	N(1)	N(1)	N	N
Public Use						
Schools	Y	N(1)	N(1)	N	**N**	**N**
Hospitals and nursing homes	Y	25	30	N	N	N
Churches, auditoria, and concert halls	Y	25	30	N	N	N
Government services	Y	Y	25	30	N	N
Transportation	Y	Y	Y(2)	Y(3)	Y(4)	Y(4)
Parking	Y	Y	Y(2)	Y(3)	Y(4)	N
Commercial Use						
Offices, business and professional	Y	Y	25	30	N	N
Wholesale and retail—building materials, hardware, and farm equipment	Y	Y	Y(2)	Y(3)	Y(4)	N
Retail trade—general	Y	Y	25	30	N	N
Utilities	Y	Y	Y(2)	Y(3)	Y(4)	N
Communication	Y	Y	25	30	N	N
Manufacturing and Production						
Manufacturing, general	Y	Y	Y(2)	Y(3)	Y(4)	N
Photographic and optical	Y	Y	25	30	N	N
Agriculture (except livestock) and forestry	Y	Y(6)	Y(7)	Y(8)	Y(8)	Y(8)
Livestock farming and breeding	Y	Y(6)	Y(7)	N	N	N
Mining and fishing, resource production and extraction	Y	Y	Y	Y	Y	Y
Recreational						
Outdoor sports arenas and spectator sports	Y	Y(5)	Y(5)	N	N	N
Outdoor music shells, amphitheaters	Y	N	N	N	N	N
Nature exhibits and zoos	Y	Y	N	N	N	N
Amusements, parks, resorts, and camps	Y	Y	Y	N	N	N
Golf courses, riding stables, and water recreation	Y	Y	25	30	N	N

Numbers in parentheses refer to notes.

* The designations contained in this table do not constitute a federal determination that any use of land covered by the program is acceptable or unacceptable under federal, state, or local law. The responsibility for determining the acceptable and permissible land uses and the relationship between specific properties and specific noise contours rests with the local authorities. FAA determinations under Part 150 are not intended to substitute federally determined land uses for those determined to be appropriate by local authorities in response to locally determined needs and values in achieving noise-compatible land uses.

KEY TO TABLE B-2

SLUCM = Standard Land-Use Coding Manual.
Y (YES) = Land Use and related structures compatible without restrictions.
N (No) = Land Use and related structures are not compatible and should be prohibited.
NLR = Noise Level Reduction (outdoor to indoor) to be achieved through incorporation of noise attenuation into the design and construction of the structure.
25, 30, or 35 = Land Use and related structures generally compatible; measures to achieve NLR of 25, 30, or 35 dB must be incorporated into design and construction of structures.

NOTES FOR TABLE B-2

(1) Where the community determines that residential or school uses must be allowed, measures to achieve outdoor-to-indoor Noise Level Reduction (NLR) of at least 25 dB and 30 dB should be incorporated into building codes and be considered in individual approvals. Normal residential construction can be expected to provide an NLR of 20 dB; thus the reduction requirements are often stated as 5, 10, or 15 dB over standard construction and normally assume mechanical ventilation and closed windows year-round. However, the use of NLR criteria will not eliminate outdoor noise problems.
(2) Measures to achieve NLR 25 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise-sensitive areas, or where the normal noise level is low.
(3) Measures to achieve NLR 30 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise-sensitive areas, or where the normal noise level is low.
(4) Measures to achieve NLR 35 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise-sensitive areas, or where the normal noise level is low.
(5) Land-use compatible provided special sound reinforcement systems are installed.
(6) Residential buildings require an NLR of 25.
(7) Residential buildings require an NLR of 30.
(8) Residential buildings not permitted.

Noise and Hearing Loss, held on January 22–24, 1990 in Washington, D.C., which states the following: "The nonauditory effects of chronic noise exposure, when noise is suspected to act as one of the risk factors in the development of hypertension, cardiovascular disease, and other nervous disorders, have never been proven to occur as chronic manifestations at levels below these criteria (an average of 75 dBA for complete protection against hearing loss for an eight-hour day). At the International Congress (1988) on Noise as a Public Health Problem, most studies attempting to clarify such health effects did not find them at levels below the criteria protective of noise-induced hearing loss, and even above these criteria, results regarding such health effects were ambiguous.

Consequently, it can be concluded that establishing and enforcing exposure levels protecting against noise-induced hearing loss would not only solve the noise-induced hearing loss problem but also any potential nonauditory health effects in the work place (von Gierke 1990; parenthetical wording added for clarification).

Although these findings were directed specifically at noise effects in the work place, they are equally applicable to aircraft noise effects in the community environment. Research studies regarding the nonauditory health effects of aircraft noise are ambiguous, at best, and often contradictory. Yet, even those studies which purport to find such health effects use time-average noise levels of 75 dB and higher for their research.

For example, in an often-quoted paper, two University of California at Los Angeles (UCLA) researchers found a relation between aircraft noise levels under the approach path to Los Angeles International Airport (LAX) and increased mortality rates among the exposed residents by using an average noise exposure level greater than 75 dB for the "noise-exposed" population (Meecham and Shaw 1979). Nevertheless, three other UCLA professors analyzed those same data and found no relation between noise exposure and mortality rates (Frerichs *et al*. 1980).

As a second example, two other UCLA researchers used this same population near LAX to show a higher rate of birth defects during the period of 1970 to 1972 when compared with a control group residing away from the airport (Jones and Tauscher 1978). Based on this report, a separate group at the United States Centers for Disease Control performed a more thorough study of populations near Atlanta's Hartsfield International Airport for 1970 to 1972 and found no relation in their study of 17 identified categories of birth defects to aircraft noise levels above 65 dB (Edmonds 1979).

A recent review of health effects, prepared by a Committee of the Health Council of The Netherlands (CHCN 1996), analyzed currently available published information on this topic. The committee concluded that the threshold for possible long-term health effects was a 16-hour (6:00 am to 10:00 pm) L_{eq} of 70 dB. Projecting this to 24 hours and applying the 10 dB nighttime penalty used with DNL, this corresponds to DNL of about 75 dB. The study also affirmed the risk threshold for hearing loss, as discussed earlier.

In summary, there is no scientific basis for a claim that potential health effects exist for aircraft time-average sound levels below 75 dB.

2.3 Annoyance

The primary effect of aircraft noise on exposed communities is one of annoyance. Noise annoyance is defined by the USEPA as any negative subjective reaction on the part of an individual or group (USEPA 1974). As noted in the discussion of DNL above, community annoyance is best measured by that metric.

Because the USEPA Levels Document (USEPA 1974) identified DNL of 55 dB as ". . . requisite to protect public health and welfare with an adequate margin of safety," it is commonly assumed that 55 dB should be adopted as a criterion for community noise analysis. From a noise exposure perspective, that would be an ideal selection. However, financial and technical resources are generally not available to achieve that goal. Most agencies have identified DNL of 65 dB as a criterion which protects those most impacted by noise, and which can often be achieved on a practical basis (FICON 1992). This corresponds to about 13 percent of the exposed population being highly annoyed.

Although DNL of 65 dB is widely used as a benchmark for significant noise impact, and is often an acceptable compromise, it is not a statutory limit, and it is appropriate to consider other thresholds in particular cases.

In this Draft EA, no specific threshold is used. The noise in the affected environment is evaluated on the basis of the information presented in this appendix and in the body of the Draft EA.

Community annoyance from sonic booms is based on CDNL, as discussed in Section 1.3. These effects are implicitly included in the "equivalent annoyance" CDNL values in Table B-1, since those were developed from actual community noise impact.

2.4 Speech Interference

Speech interference associated with aircraft noise is a primary cause of annoyance to individuals on the ground. The disruption of routine activities in the home, such as radio or television listening, telephone use, or family conversation, gives rise to frustration and irritation. The quality of speech communication is also important in classrooms, offices, and industrial settings and can cause fatigue and vocal strain in those who attempt to communicate over the noise. Research has shown that the use of the SEL metric will measure speech interference successfully, and that a SEL exceeding 65 dB will begin to interfere with speech communication.

2.5 Sleep Interference

Sleep interference is another source of annoyance associated with aircraft noise. This is especially true because of the intermittent nature and content of aircraft noise, which is more disturbing than continuous noise of equal energy and neutral meaning.

Sleep interference may be measured in either of two ways. "Arousal" represents actual awakening from sleep, while a change in "sleep stage" represents a shift from one of four sleep stages to another stage of lighter sleep without actual awakening. In general, arousal requires a somewhat higher noise level than does a change in sleep stage.

An analysis sponsored by the Air Force summarized 21 published studies concerning the effects of noise on sleep (Pearsons *et al*. 1989). The analysis concluded that a lack of reliable in-home studies, combined with large differences among the results from the various laboratory studies, did not permit development of an acceptably accurate assessment procedure. The noise events used in the laboratory studies and in contrived in-home studies were presented at much higher rates of occurrence than would normally be experienced. None of the laboratory studies were of sufficiently long duration to determine any effects of habituation, such as that which would occur under normal community conditions. A recent extensive study of sleep interference in people's own homes (Ollerhead 1992) showed very little disturbance from aircraft noise.

There is some controversy associated with the recent studies, so a conservative approach should be taken in judging sleep interference. Based on older data, the USEPA identified an indoor DNL of 45 dB as necessary to protect against sleep interference (USEPA 1974). Assuming a very conservative structural noise insulation of 20 dB for typical dwelling units, this corresponds to an outdoor DNL of 65 dB as minimizing sleep interference.

A 1984 publication reviewed the probability of arousal or behavioral awakening in terms of SEL (Kryter 1984). Figure B-4, extracted from Figure 10.37 of Kryter (1984), indicates that an indoor SEL of 65 dB or lower should awaken less than 5 percent of those exposed. These results do not include any habituation over time by sleeping subjects. Nevertheless, this provides a reasonable guideline for assessing sleep interference and corresponds to similar guidance for speech interference, as noted above.

2.6 Noise Effects on Domestic Animals and Wildlife

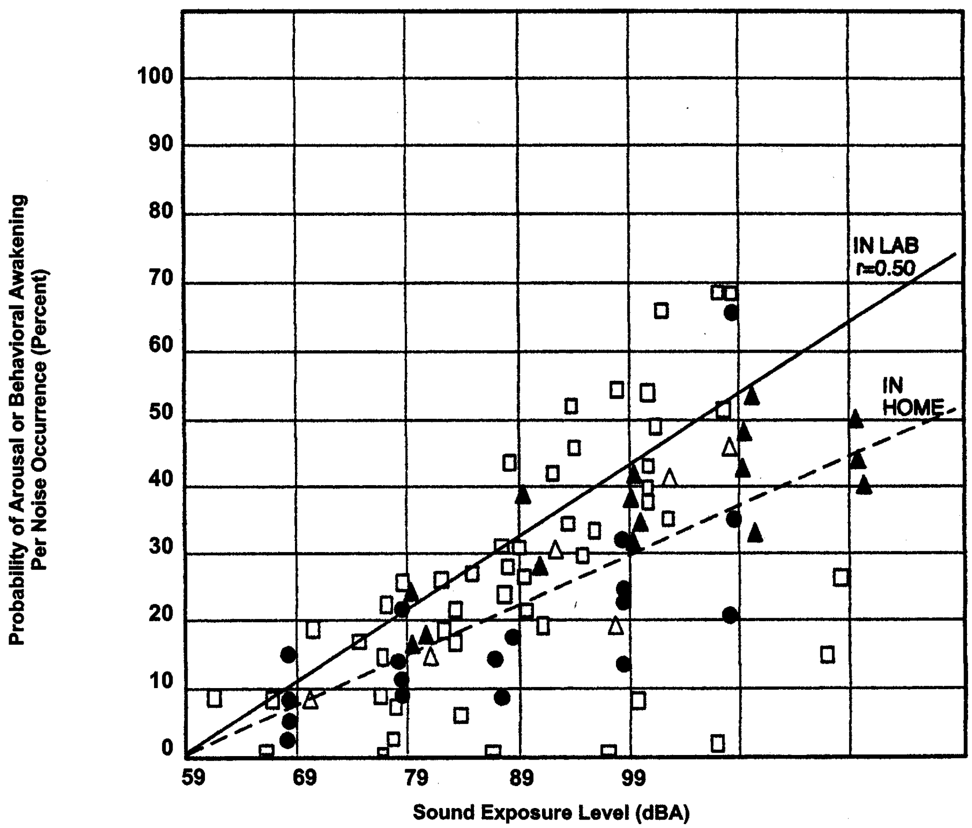
Animal species differ greatly in their responses to noise. Each species has adapted, physically and behaviorally, to fill its ecological role in nature, and its hearing ability usually reflects that role. Animals rely on their hearing to avoid predators, obtain food, and communicate with and attract other members of their species. Aircraft noise may mask or interfere with these functions. Secondary effects may include nonauditory effects similar to those exhibited by humans: stress, hypertension, and other nervous disorders. Tertiary effects may include interference with mating and resultant population declines.

In the absence of definitive data on the effect of noise on animals, the Committee on Hearing, Bioacoustics, and Biomechanics of the National Research Council has proposed that protective noise criteria for animals be taken to be the same as for humans (NRC NAS 1977).

2.7 Noise Effects on Structures

Subsonic Aircraft Noise

Normally, the most sensitive components of a structure to airborne noise are the windows and, infrequently, the plastered walls and ceilings. An evaluation of the peak sound pressures impinging on the structure is normally sufficient to determine the possibility of damage. In general, at sound levels above 130 dB, there is the possibility of the excitation of structural component resonance. While certain frequencies (such as 30 Hz for window breakage) may be of more concern than other frequencies, conservatively, only sounds lasting more than one second above a sound level of 130 dB are potentially damaging to structural components (NRC NAS 1977).



LEGEND

- □ Laboratory Studies, Variety of Noises, Lukas
- ● Steady State (In Home)
- ▲ Transient (In Home)
- △ Truck Noise, Laboratory Study, Thiesen
  Transformer, Transmission Line, Window Air Conditioner, and Distant Traffic Noise, Horonjeff

Figure B-4. Probability of Arousal or Behavioral Awakening in Terms of Sound Exposure Level

A recent study, directed specifically at low-altitude, high-speed aircraft on MTRs showed that there is little probability of structural damage from such operations (Sutherland 1989). One finding in that study is that sound levels at damaging frequencies (e.g., 30 Hz for window breakage or 15 to 25 Hz for whole-house response) are rarely above 130 dB.

Noise-induced structural vibration may also cause annoyance to dwelling occupants because of induced secondary vibrations, or "rattle," of objects within the dwelling, such as hanging pictures, dishes, plaques, and bric-a-brac. Window panes may also vibrate noticeably when exposed to high levels of airborne noise, causing homeowners to fear breakage. In general, such noise-induced vibrations occur at sound levels above those considered normally incompatible with residential land use. Thus assessments of noise exposure levels for compatible land use should also be protective of noise-induced secondary vibrations.

2.8 Noise Effects on Terrain

Members of the public often believe that noise from low-flying aircraft can cause avalanches or landslides by disturbing fragile soil or snow structures in mountainous areas. There are no known instances of such effects, and it is considered improbable that such effects will result from routine, subsonic aircraft operations**.**

2.9 Noise Effects on Historical and Archaeological Sites

Because of the potential for increased fragility of structural components of historical buildings and other historical sites, aircraft noise may affect such sites more severely than newer, modern structures. Again, there are few scientific studies of such effects to provide guidance for their assessment.

One study involved the measurements of sound levels and structural vibration levels in a superbly restored plantation house, originally built in 1795, and now situated approximately 1,500 feet from the centerline at the departure end of Runway 19L at Washington Dulles International Airport. These measurements were made in connection with the proposed scheduled operation of the supersonic Concorde airplane at Dulles (Wesler 1977). There was special concern for the building's windows, since roughly half of the 324 panes were original. No instances of structural damage were found. Interestingly, despite the high levels of noise during Concorde takeoffs, the induced structural vibration levels were actually less than those induced by touring groups and vacuum cleaning within the building itself.

Table B-3. Possible Damage to Structures From Sonic Booms		
Sonic Boom Overpressure Nominal (psf)	*Type of Damage*	*Item Affected*
0.5 - 2	Plaster	Fine cracks; extension of existing cracks; more in ceilings; over door frames; between some plaster boards.
	Glass	Rarely shattered; either partial or extension of existing.
	Roof	Slippage of existing loose tiles/slates; sometimes new cracking of old slates at nail hole.
	Damage to outside walls	Existing cracks in stucco extended.
	Bric-a-brac	Those carefully balanced or on edges can fall; fine glass, such as large goblets, can fall and break.
	Other	Dust falls in chimneys.
2 - 4	Glass, plaster, roofs, ceilings	Failures show that would have been difficult to forecast in terms of their existing localized condition. Nominally in good condition.
4 - 10	Glass	Regular failures within a population of well-installed glass; industrial as well as domestic greenhouses.
	Plaster	Partial ceiling collapse of good plaster; complete collapse of very new, incompletely cured, or very old plaster.
	Roofs	High probability rate of failure in nominally good state, slurry-wash; some chance of failures in tiles on modern roofs; light roofs (bungalow) or large area can move bodily.
	Walls (out)	Old, free standing, in fairly good condition can collapse.
	Walls (in)	Inside ("party") walls known to move at 10 psf.
Greater than 10	Glass	Some good glass will fail regularly to sonic booms from the same direction. Glass with existing faults could shatter and fly. Large window frames move.
	Plaster	Most plaster affected.
	Ceilings	Plaster boards displaced by nail popping.
	Roofs	Most slate/slurry roofs affected, some badly; large roofs having good tile can be affected; some roofs bodily displaced causing gale-end and will-plate cracks; domestic chimneys dislodged if not in good condition.
	Walls	Internal party walls can move even if carrying fittings such as hand basins or taps; secondary damage due to water leakage.
	Bric-a-brac	Some nominally secure items can fall; e.g., large pictures, especially if fixed to party walls.

Source: Haber and Nakaki 1989

As noted above for the noise effects of noise-induced vibrations of normal structures, assessments of noise exposure levels for normally compatible land uses should also be protective of historic and archaeological sites.

3.0 NOISE MODELING

3.1 Subsonic Aircraft Noise

An aircraft in subsonic flight generally emits noise from two sources: the engines and flow noise around the airframe. Noise generation mechanisms are complex and, in practical models, the noise sources must be based on measured data. The Air Force has developed a series of computer models and aircraft noise databases for this purpose. The models include NOISEMAP (Moulton 1992) for noise around airbases, ROUTEMAP (Lucas and Plotkin 1988) for noise associated with low-level training routes, and MR_NMAP (Lucas and Calamia 1996) for use in MOAs and ranges. These models use the NOISEFILE database developed by the Air Force. NOISEFILE data includes SEL and L_{Amax} as a function of speed and power setting for aircraft in straight flight.

Noise from an individual aircraft is a time-varying continuous sound. It is first audible as the aircraft approaches, increases to a maximum when the aircraft is near its closest point, then diminishes as it departs. The noise depends on the speed and power setting of the aircraft and its trajectory. The models noted above divide the trajectory into segments whose noise can be computed from the data in NOISEFILE. The contributions from these segments are summed.

MR_NMAP was used to compute noise levels on the MTRs and in the MOAs and Warning Areas. The primary noise metric computed by MR_NMAP was L_{dnmr} averaged over each airspace. Supporting routines from NOISEFILE were used to calculate SEL and L_{Amax} for various flight altitudes and lateral offsets from a ground receiver position.

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Appendix B

Interagency and Intergovernmental Coordination for Environmental Planning

DEPARTMENT OF THE AIR FORCE
97th AIR MOBILITY WING
ALTUS AIR FORCE BASE OKLAHOMA

16 DEC 2002

Dan E. Staton
Chief, Environmental Flight
97th Civil Engineer Squadron
401 L Avenue
Altus AFB OK 73523

United States Department of Agriculture
Larry Odom
Hollis Service Center
320 N Main Street
Hollis, OK 73550-3037

Dear Mr. Odom:

The United States Air Force is preparing an environmental assessment for a proposal to add up to eight C-17 aircraft at Altus AFB. In addition, the Air Force is considering the construction of an Assault Landing Zone near the existing Sooner Drop Zone. The attachments to this letter describe the proposal and the alternatives being analyzed in accordance with the Council on Environmental Quality guidelines pursuant to the National Environmental Policy Act of 1969. In accordance with Executive Order 12372, Intergovernmental Review of Federal Programs, we request your participation by reviewing this memo describing the proposed action and alternatives, and solicit your comments concerning the proposal and any potential environmental consequences of the action.

Any questions concerning the proposal should be directed to our consultant, Science Applications International Corporation (SAIC). The point of contact at SAIC is Mr. Kent R. Wells. He can be reached at (210) 731-2217. Please forward your written comments to Mr. Jim Bellon, 97 CES/CEVN, at the address indicated above. Thank you for your assistance.

Sincerely,

Dan E. Staton

DAN E. STATON
Chief, Environmental Flight

Attachment
Form AD-1006

United States Department of Agriculture

NRCS

Natural Resources Conservation Service
Hollis Field Office
USDA Service Center
Hollis, OK 73550
Telephone 580.688.3456, extension 3

July 7, 2003

Mr. Jim Bellon
97 CES/CEVN
401 L. Avenue
Altus AFB, OK 73523

Dear Mr. Bellon:

Enclosed is the AD-1006, Farmland Conversion Impact Rating, for a proposed Assault Landing Zone in Harmon County, Oklahoma.

I have made some adjustments on the acres of prime farmland under section IIIB and IIIC on the form. I also made some adjustments on Table 3-2, Soil Types. These same adjustments, I carried forward in the body of the text under paragraph 4.3.3.2.2, Sooner Drop Zone. In reviewing these changes, if you do not agree, please contact me and we can double check the calculations.

Due to the high percentage of prime farmland being involved in this proposal, we would concur with your statement in paragraph 4.3.3.2.2 to return the remainder of the site back to agricultural utilization after the construction is completed and hopefully details could be worked out with landusers that would allow the same agricultural production that was practiced prior to construction if the project is carried to conclusion.

Sincerely,

Larry Odom

Larry Odom
District Conservationist
Natural Resources Conservation Service

cc: Dan E. Staton, Chief, Environ Flight, 97 CES, 401 L Avenue, Altus AFB, OK 73523
Kent R. Wells, Project Mgr., SAIC, 4242 Woodcock, Ste 150, San Antonio, TX 78228

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*	Date Of Land Evaluation Request 6/10/03
Name Of Project C-17 Program Changes	Federal Agency Involved US Air Force
Proposed Land Use Assault Landing Zone	County And State Harmon County, Oklahoma
PART II *(To be completed by NRCS)*	Date Request Received By NRCS 6/30/03

Does the site contain prime, unique, statewide or local important farmland? *(If no, the FPPA does not apply -- do not complete additional parts of this form).*	Yes ☒	No ☐	Acres Irrigated 0	Average Farm Size 320
Major Crop(s) Small Grain Native Grass	Farmable Land In Govt. Jurisdiction Acres: 229,338 % 68		Amount Of Farmland As Defined in FPPA Acres: 127,527 % 38	
Name Of Land Evaluation System Used Harmon County LESA	Name Of Local Site Assessment System None		Date Land Evaluation Returned By NRCS 07/07/2003	

PART III *(To be completed by Federal Agency)*		Alternative Site Rating			
		Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly		23.3	20.4		
B. Total Acres To Be Converted Indirectly		549.1	516.7		
C. Total Acres In Site		572.4	537.1	0.0	0.0
PART IV *(To be completed by NRCS)* Land Evaluation Information					
A. Total Acres Prime And Unique Farmland		572.4	537.1	0	0
B. Total Acres Statewide And Local Important Farmland		0	0	0	0
C. Percentage Of Farmland In County Or Local Govt. Unit To Be Converted		0.5	0.4	0	0
D. Percentage Of Farmland In Govt. Jurisdiction With Same Or Higher Relative Value		8.5	8.5		
PART V *(To be completed by NRCS)* Land Evaluation Criterion Relative Value Of Farmland To Be Converted *(Scale of 0 to 100 Points)*		100	90.6	0	0
PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(These criteria are explained in 7 CFR 658.5(b))*	Maximum Points				
1. Area In Nonurban Use					
2. Perimeter In Nonurban Use					
3. Percent Of Site Being Farmed					
4. Protection Provided By State And Local Government					
5. Distance From Urban Builtup Area					
6. Distance To Urban Support Services					
7. Size Of Present Farm Unit Compared To Average					
8. Creation Of Nonfarmable Farmland					
9. Availability Of Farm Support Services					
10. On-Farm Investments					
11. Effects Of Conversion On Farm Support Services					
12. Compatibility With Existing Agricultural Use					
TOTAL SITE ASSESSMENT POINTS	160	0	0	0	0
PART VII *(To be completed by Federal Agency)*					
Relative Value Of Farmland *(From Part V)*	100	0	0	0	0
Total Site Assessment *(From Part VI above or a local site assessment)*	160	0	0	0	0
TOTAL POINTS *(Total of above 2 lines)*	260	0	0	0	0

Site Selected: Decision is pending	Date Of Selection	Was A Local Site Assessment Used? Yes ☐ No ■

Reason For Selection:

For Sooner ALZ 1 (Site A): Only 23.3 acres would be paved. The remainder of the site would be returned to agricultural use following completion of construction activities.

For Sooner ALZ 2 (Site B): Only 20.4 acres would be paved. The remainder of the site would be returned to agricultural use following completion of construction activities.

DEPARTMENT OF THE AIR FORCE
97th AIR MOBILITY WING
ALTUS AIR FORCE BASE OKLAHOMA

16 DEC 2002

Dan E. Staton
Chief, Environmental Flight
97th Civil Engineer Squadron
401 L Avenue
Altus AFB OK 73523

Melvena Heisch, Deputy State Historic Preservation Officer
Oklahoma State Historic Preservation Office
Oklahoma Historical Society
2704 Villa Prom, Shepherd Mall
Oklahoma City, OK 73107

Dear Ms. Heisch:

We request your participation in a Section 106 review process for federal undertakings in Harmon and Washita counties, Oklahoma, currently under consideration. The proposals are to expand the Sooner Drop Zone where cargo airdrop training is accomplished and construct a 5,000-foot Assault Landing Zone (ALZ) where combat assault training for C-17 aircrews would be conducted.

Five candidate sites under study have been consolidated into three study areas: 1) Sooner Drop Zone expansion area; 2) ALZ area near the Sooner Drop Zone; and 3) ALZ area at Clinton-Sherman Industrial Airpark. Potential use of these sites and locations are provided in the attachment.

We have hired an environmental consultant, Science Applications International Corporation (SAIC), to initiate and complete environmental work related to this project. For the cultural resources aspects of the project, SAIC has contracted with Dr. Stanley D. Bussey (Archaeology & Permit Development Services, LLC) who will perform necessary services. SAIC and Bussey are preparing a methodology report for the study areas that will be used as a guideline for the balance of the cultural resources part of the project. Where appropriate, your comments and those of the Oklahoma Archeological Survey will be incorporated in that report and we will request your review of the methodology section of the report when it is completed.

Because of the size of the various proposed expansion and construction areas, the Air Force prefers to begin any necessary cultural resources field work as soon as possible and would be grateful for any priority that you can give our request. We request your determination if a field survey for these locations is necessary.

Please return your comments to Mr. Jim Bellon, 97 CES/CEVN, 401 L Avenue, Altus AFB, Oklahoma 73523-5138. If you have any questions, or if you need additional information, please call Mr. Bellon at (580) 481-7606.

Sincerely,

Dan E. Staton

DAN E. STATON
Chief, Environmental Flight

Attachment
Candidate Site Summary

cc: Oklahoma Archeological Survey

DEPARTMENT OF THE AIR FORCE
97th AIR MOBILITY WING
ALTUS AIR FORCE BASE OKLAHOMA

16 DEC 2002

Dan E. Staton
Chief, Environmental Flight
97th Civil Engineer Squadron
401 L Avenue
Altus AFB OK 73523

Charles S. Wallis, RPA
Oklahoma State Historic Preservation Office
Oklahoma Historical Society
2704 Villa Prom, Shepherd Mall
Oklahoma City, OK 73107

RE: File #0415-03, Sooner Drop Zone Expansion
Sooner Assault Landing Zone, Options 1 and 2

Dear Mr. Wallis:

Enclosed for your use in continuing the Section 106 review of the proposed Sooner Assault Landing Zone and Sooner Drop Zone Expansion are two (2) Draft Archeological Survey Reports.

We have hired an environmental consultant, Science Applications International Corporation (SAIC), to initiate and complete environmental work related to this project. For the cultural resources aspects of the project, SAIC has contracted with Dr. Stanley D. Bussey (Archaeology & Permit Development Services, LLC) who performed the surveys.

Please return your comments to Mr. Jim Bellon, 97 CES/CEVN, 401 L Avenue, Altus AFB, Oklahoma 73523-5138. If you have any questions, or if you need additional information, please call Mr. Stanley D. Bussey at (405) 701-3164.

Sincerely,

Dan E. Staton

DAN E. STATON
Chief, Environmental Flight

Attachment

Oklahoma Historical Society *Founded May 27, 1893*

State Historic Preservation Office • 2704 Villa Prom • Shepherd Mall • Oklahoma City, OK 73107-2441
Telephone 405/521-6249 • Fax 405/947-2918

July 21, 2003

mailed to Stan Bussey 8-11-03

5841

Mr. James Bellon, GS-11
Chief, Natural & Cultural Resources
401 "L" Avenue (97 CES/CEV)
Altus AFB, OK 73523-5138

RE: File #0415-03; Altus Air Force Base Sooner Drop Zone & Assault Landing Zone Projects, Harper County, Oklahoma

Dear Mr. Bellon:

We have reviewed two cultural resource reports compiled by Science Applications International Corp. (SAIC), contracting with Dr. Stanley Bussey Archaeology & Permit Development Services, LLC. A number of historic farmsteads dating from the early through late-1900s were documented within the project boundaries.

We defer to Dr. Robert Brooks, State Archeologist, for comments on the prehistoric sites and resources discussed in the reports. Our comments address the findings and recommendations concerning sites dating from the Historic Period.

The Sooner Drop Zone expansion project has the potential to affect five historic sites (34HR40-44). Of these five sites, Dr. Bussey recommends avoidance or testing of two locations (34HR40 and 34HR42) as they appear to be potentially eligible for listing on the National Register of Historic Places.

The Assault Landing Zone (Options 1 & 2) involves 25 historic farmsteads and/or trash dumps affiliated with historic use of the region. Of these locations, Dr. Bussey recommends avoidance or testing of four locations: sites 34HR46, 34HR117, 34HR121 & 34HR127.

The six historic farmsteads recommended for avoidance or testing were viewed by Dr. Bussey to be potentially eligible for listing in the National Register of Historic Places. The basis of that determination was that the locations retain some integrity of deposits with identifiable features; therefore, they may be eligible under Criterion "D." Before we can agree that these sites are eligible for listing in the National Register, we will need additional information on the past history of ownership and development for each site. Dr. Bussey has for most locations, presented names of the person filing the first claim on the property and in some cases obtaining the patent for the property. However, the potential of multiple occupancies of each location has not been adequately addressed.

Just because a person or family filed a claim on the tract of land containing the archeological site and occupied the tract long enough to obtain a patent on the property, does not mean that the farmstead in question was only occupied by that person or family; particularly since most present evidence of use well up into the 1940s and after.

COPY

RE: File #0415-03; Altus Air Force Base Sooner Drop Zone & Assault Landing Zone Projects, Harper County, Oklahoma

Also, if more than one historic site is situated within the quarter section, which farmstead applies to the initial occupant is also brought into question. If the properties were occupied by multiple families over the 40, 50 or 60 year history of the site, then the potential of addressing Criterion "D" questions will be seriously diminished and the sites should not normally be considered eligible properties.

Additional testing (more than the level of shovel testing accomplished so far) will also be necessary to determine if the locations identified and discussed in the reports are indeed the original homesteads for the tracts in question or if they simply reflect later occupations.

Furthermore, two of the historic sites not recommended for additional work (34HR111 & 34HR112), as viewed to contain dispersed materials in a heavily farmed setting, need additional consideration. These locations may be presenting evidence of earlier, shorter term initial occupations. This is based on the brief descriptions of materials recovered along with the settings which are more in the center of the section away from later established section line roads. We recommend that they should be treated with the same degree of concern as for those locations recommended for avoidance or testing. Consequently the same level of documentation outlined for the six sites considered by Dr. Bussey to possibly be eligible sites applies to these two locations as well.

Also discussed in the most recently submitted reports are several locations with standing historic buildings and/or structures that have already been reviewed by us and determined not to be eligible properties. These locations are: an Irrigation Well site, the Willis E. Wood House, the Delane Ranch Grain Bin Structures and the R. Motley Ranch Goat Corral Structures. Our opinion of these locations has not changed.

Thank you for the opportunity to review this project. If you have any questions, please call Charles Wallis, Historical Archeologist, at 405/521-6381. Please reference the above underlined file number when responding. Thank you.

Sincerely,

Melvena Heisch

Melvena Heisch
Deputy State Historic
Preservation Officer

MH:pm

cc: Robert Brooks, OAS

Oklahoma Archeological Survey
THE UNIVERSITY OF OKLAHOMA

February 10, 2003

Stanley D. Bussey
Archaeologist
Archaeology & Permit Development Services
3700 West Robinson, Suite 200
Norman, OK 73072

Re: Proposed Sooner Drop Zone Expansion, Sooner Drop Zone Assault Landing Zones, and Clinton Sherman Assault Landing Zones, Altus Air Force Base. Legal Description: Section 14 (Sooner Addition), W ½ Sections 15, 22, and 27 & E ½ Sections 16, 21, and 28 (Sooner Assault Landing) T1N R24W, Harmon County; and portions of Sections 9 and 16 (Clinton-Sherman Assault Landing) T10N R19W, Washita County, Oklahoma.

Dear Mr. Bussey:

This letter serves as a replacement for previous comments on this proposed action (letter dated January 24, 2003) as well as on the draft Methodology Report submitted for review.

There are two revisions to the earlier review comments. In the January 24, 2003 response, this office failed to address the proposed Sooner Drop Zone Assault Landing Zones located to the southwest of the existing Sooner Drop Zone (see legals noted above). As noted in the Methodology Report, this is an area for which we would recommend a cultural resource inventory. The second revision concerns the SE ¼ of Section 4 T10N R19W that was included for review in the initial project design submitted for review. This area, containing archaeological site 34WA64, was recommended for survey. I understand that the southeast quarter of Section 4 was not part (or is no longer a part) of the proposed action. Thus, we rescind our earlier recommendation concerning this tract of land. I would add however, that should Altus Air Force Base look at this area for a proposed action in the future, this recommendation would still hold.

In regard to the draft Methodology Report, I do not have extensive comments. My only concern would be that diagnostic prehistoric materials also be analyzed in the field. As there will be no a no collection policy, this will be necessary to adequately document

material for the review process. Such analyses would include basic metrics, material composition, and stylistic attributes. The State Historic Preservation Office may also have additional considerations concerning historic archaeological sites and historic structural properties.

Sincerely,

Robert L. Brooks
State Archaeologist

Cc: SHPO
D. Staton, Altus AFB

Oklahoma Archeological Survey
THE UNIVERSITY OF OKLAHOMA

June 27, 2003

Dan E. Staton
Chief, Environmental Flight
Department of the Air Force
97th Civil Engineer Squadron
401 L. Avenue
Altus AFB, 73523

Re: Proposed Sooner Assault Landing Zone, Options 1 and 2.
Legal Description: W ½ Section 15, W ½ Section 22, and NW ¼ Section 27 (Option 1) and E ½ Section 16, E ½ Section 21, and NE ¼ Section 28 (Option 2) T1N R24W, Harmon County, Oklahoma.

Dear Mr. Staton:

I have received a report documenting the results of a cultural resource inventory conducted for the above referenced action. This work was performed by Archeological and Project Development Services on February 26-28, March 5-12, 21, and 25, 2003. The inspections of some 1600 acres representing the area of potential effect within Options 1 and 2 resulted in the recording of 29 prehistoric and historic archaeological sites, two structural remains, 44 isolated finds, six cases of modern material culture.

Archaeological sites within Option 1 were recorded as 34MR119-130. Of these, 34MR128 and 34MR129 are prehistoric occupations and 34MR 120 also contains a prehistoric component. The three sites with prehistoric materials reflect limited scatters of prehistoric chipped and ground stone material of undetermined cultural affiliation. None of these prehistoric manifestations demonstrate evidence of substantive content such as features, midden deposits, or dense material remains. Sites 34MR128 and 34MR129 as well as the prehistoric component at 34MR120 also show no evidence of quality context in form of intact cultural deposits. Thus, it is my opinion that prehistoric manifestations at the three sites do not hold the content or context worthy of National Register of Historic Places eligibility and no further treatment is warranted. **I defer comment on the potential eligibility of the remaining historic archaeological sites and structural remains as well as project effect to the Historic Archaeologist with the Historic Preservation Office.**

Archaeological sites found within Option 2 were recorded as 34MR45-34MR50 and 34MR 108-34MR118. Of these sites, only 34MR49, 34MR50, and 34MR115 are represented by prehistoric material. Much like the prehistoric sites in the area of Option 1, they contain limited scatters of chipped stone cultural material. None appear to hold the content in terms of features or midden or the context to merit further National Register eligibility consideration. It is my opinion that they merit no further treatment measures. **Comment on the potential eligibility of the remaining 14 sites historic scatters and homesteads as well as the structural remains and project effect is again deferred to the Historic Preservation Office.**

A number of my comments pertaining to the report on the Sooner Drop Zone are also present in this Sooner Assault Landing Zone document. There is no mention of the Perry Ranch site and there is an absence of discussion concerning the Red Bed Plains Village Farming cultural period.

This review has been conducted in cooperation with the State Historic Preservation Office, Oklahoma Historical Society.

Sincerely,

Robert L. Brooks
State Archaeologist

Cc: SHPO
Stanley Bussey
Wichita and Affiliated Tribes
Kiowa Tribe
Apache Tribe
Comanche Tribe

DEPARTMENT OF THE AIR FORCE
97th AIR MOBILITY WING
ALTUS AIR FORCE BASE OKLAHOMA

16 DEC 2002

[redacted]
Dan E. Staton
Chief, Environmental Flight
97th Civil Engineer Squadron
401 L Avenue
Altus AFB OK 73523

Mr. Doug Graham
Federal Aviation Administration
FAA Headquarters, AST-100
800 Independence Avenue, SW
Room 331
Washington, D.C. 20591

Dear Mr. Graham

The United States Air Force is preparing an environmental assessment for a proposal to add up to eight C-17 aircraft at Altus AFB. The attachment to this letter describes the proposal and the alternatives being analyzed in accordance with the Council on Environmental Quality guidelines pursuant to the National Environmental Policy Act of 1969. In accordance with Executive Order 12372, Intergovernmental Review of Federal Programs, and as a cooperating agency for the C-17 Aircrew Program Changes, we request your participation by reviewing this memo describing the proposed action and alternatives and solicit your comments concerning the proposal and any potential environmental consequences of the action.

Any questions concerning the proposal should be directed to our consultant, Science Applications International Corporation (SAIC). The point of contact at SAIC is Mr. Kent Wells. He can be reached at (210) 731-2217. Please forward your written comments to Mr. Jim Bellon, 97 CES/CEVN, at the address indicated above. Thank you for your assistance.

Sincerely,

Dan E Staton

DAN E. STATON
Chief, Environmental Flight

Attachment
Description of Proposed Action and Alternatives

U.S. Department
of Transportation

Federal Aviation
Administration

Commercial Space Transportation

800 Independence Ave. SW., Room 331
Washington, D.C. 20591

DEC 17

HQ AETC/CE
266 F Street West
Randolph AFB TX 78150-4319
ATTN: Mr. Paul A. Parker

Dear Mr. Parker:

Thank you for requesting FAA/AST participate as a cooperating agency on the Environmental Assessment (EA) for C-17 Aircrew Program Changes (your letter dated November 27 2002). We accept cooperating agency status on the EA and look forward to working with you.

The point of contact for this effort will be Mr. Doug Graham. His email is doug.graham@faa.gov and his telephone number is (202) 267-8568. FAXes may be sent to (202) 267-5463. Our mailing address is:

FAA Headquarters, AST-100
800 Independence Ave., S.W.
Room 331
Washington, D.C. 20591

Sincerely,

Patricia G. Smith
Associate Administrator for
Commercial Space Transportation

cc: E. Elmore, AGC-620
H. Bachner, AST-100

DEPARTMENT OF THE AIR FORCE
97th AIR MOBILITY WING
ALTUS AIR FORCE BASE OKLAHOMA

16 DEC 2002

Dan E. Staton
Chief, Environmental Flight
97th Civil Engineer Squadron
401 L Avenue
Altus AFB OK 73523

Merritt E. Youngdeer, Muskogee Area Director
US Bureau of Indian Affairs
Federal Building and US Courthouse
101 North 5th Street
Muskogee, OK 74101

Dear Mr. Youngdeer

The United States Air Force is preparing an environmental assessment for a proposal to add up to eight C-17 aircraft at Altus AFB. The attachment to this letter describes the proposal and the alternatives being analyzed in accordance with the Council on Environmental Quality guidelines pursuant to the National Environmental Policy Act of 1969. In accordance with Executive Order 12372, Intergovernmental Review of Federal Programs, we request your review and solicit your comments concerning the proposal and any potential environmental consequences of the action.

Any questions concerning the proposal should be directed to our consultant, Science Applications International Corporation (SAIC). The point of contact at SAIC is Mr. Kent Wells. He can be reached at (210) 731-2217. Please forward your written comments to Mr. Jim Bellon, 97 CES/CEVN, at the address indicated above. Thank you for your assistance.

Sincerely,

Dan E Staton

DAN E. STATON
Chief, Environmental Flight

Attachment
Description of Proposed Action and Alternatives

United States Department of the Interior
BUREAU OF INDIAN AFFAIRS
Eastern Oklahoma Regional Office
P.O. Box 8002
Muskogee, OK 74402-8002

IN REPLY REFER TO:
Natural Resources

FEB 2 0 2003

Mr. Dan E. Staton
Chief, Environmental Flight
97th Civil Engineering Squadron
401 L Avenue
Altus Air Force Base, Oklahoma 73523

Dear Mr. Staton:

On February 4, 2003, the Eastern Oklahoma Regional Office (EORO), Bureau of Indian Affairs (BIA), received and reviewed your public notice regarding the proposed expansion of adding up to eight C-17 aircraft at Altus Air Force Base, Jackson County, Oklahoma. For your information, the project is within the service area of the Southern Plains Regional Office, BIA, located in Anadarko, Oklahoma. A copy of the public notice will be forwarded to this office for review and comment.

If additional information is needed, please contact Mr. Jimmy Gibson, Acting Branch Chief, Branch of Natural Resources, Eastern Oklahoma Regional Office, at (918) 781-4642.

Respectfully,

Jeanne

Director

DEPARTMENT OF THE AIR FORCE
97th AIR MOBILITY WING
ALTUS AIR FORCE BASE OKLAHOMA

16 DEC 2002

Dan E. Staton
Chief, Environmental Flight
97th Civil Engineer Squadron
401 L Avenue
Altus AFB OK 73523

Oklahoma Department of Wildlife Conservation
Natural Resources Section
1801 North Lincoln
P.O. Box 53465
Oklahoma City, OK 73105

Dear Agency Representative

The United States Air Force is preparing an environmental assessment for a proposal to add up to eight C-17 aircraft at Altus AFB. The attachment to this letter describes the proposal and the alternatives being analyzed in accordance with the Council on Environmental Quality guidelines pursuant to the National Environmental Policy Act of 1969. In accordance with Executive Order 12372, Intergovernmental Review of Federal Programs, we request your review and solicit your comments concerning the proposal and any potential environmental consequences of the action. Any questions concerning the proposal should be directed to our consultant, Science Applications International Corporation (SAIC). The point of contact at SAIC is Mr. Kent Wells. He can be reached at (210) 731-2217. Please forward your written comments to Mr. Jim Bellon, 97 CES/CEVN, at the address indicated above. Thank you for your assistance.

Sincerely,

Dan E Staton

DAN E. STATON
Chief, Environmental Flight

Attachment
Description of Proposed Action and Alternatives

OKLAHOMA

BRAD HENRY, GOVERNOR
GREG D. DUFFY, DIRECTOR

DEPARTMENT OF WILDLIFE CONSERVATION

1801 N. Lincoln   P.O. Box 53465   Oklahoma City, OK 73152   PH. 521-3851

February 21, 2003

Dan E. Staton
Department of the Air Force
401 L. Avenue
Altus, OK 73523

Dear Mr. Staton,

This responds to your letters of January 27, 2003 requesting information regarding the possible presence of state threatened or endangered species as well as any environmental impact for the following:

Projects:	Locations:
Expansion of Sooner Drop Zone	Altus AFB, Jackson Co., Oklahoma
Proposal to Implement C-17 and KC-135	Lawton/Fort Sill Airport, Henry Post Army Airfield
Proposal to Add Eight C-17 Aircrafts	Altus AFB, Jackson Co., Oklahoma

Please understand that due to time and personnel constraints this Department has not conducted an actual field survey of the proposed site. Therefore, we are unable to provide site-specific information. We have reviewed the information provided for this project against our current records of state endangered and threatened species. Our records are compatible with the Oklahoma Natural Heritage Inventory and it appears that no state listed species would be affected.

Please be sure to contact the United States Fish and Wildlife Service's Tulsa office (918-581-7458) to determine if any federally-listed species will be affected. For additional information concerning sensitive species, we recommend that you contact the Oklahoma Natural Heritage Inventory, 111 East Chesapeake, Norman, Oklahoma 73019.

Thank you for the opportunity to comment. If we can be of further assistance, please contact our Natural Resources Section at 405-521-4616.

Sincerely,

Thomas Heuer
Natural Resources Biologist

DEPARTMENT OF THE AIR FORCE
97th AIR MOBILITY WING
ALTUS AIR FORCE BASE OKLAHOMA

16 DEC 2002

Dan E. Staton
Chief, Environmental Flight
97th Civil Engineer Squadron
401 L Avenue
Altus AFB OK 73523

Department of the Army
Tulsa District, US Army Corps of Engineers
1645 South 101st East Ave
Tulsa, OK 74128-4609

Dear Corps of Engineers Representative

The United States Air Force is preparing an environmental assessment for a proposal to add up to eight C-17 aircraft at Altus AFB. The attachment to this letter describes the proposal and the alternatives being analyzed in accordance with the Council on Environmental Quality guidelines pursuant to the National Environmental Policy Act of 1969. In accordance with Executive Order 12372, Intergovernmental Review of Federal Programs, we request your review and solicit your comments concerning the proposal and any potential environmental consequences of the action.

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Sincerely,

Dan E. Staton

DAN E. STATON
Chief, Environmental Flight

Attachment
Description of Proposed Action and Alternatives

DEPARTMENT OF THE AIR FORCE
97th AIR MOBILITY WING
ALTUS AIR FORCE BASE OKLAHOMA

16 DEC 2002

Dan E. Staton
Chief, Environmental Flight
97th Civil Engineer Squadron
401 L Avenue
Altus AFB OK 73523

Ms. Margaret Graham
Oklahoma Department of Environmental Quality
Consumer Assistance Program
P.O. 1677
Oklahoma City, Oklahoma 73101

Dear Ms. Graham

The United States Air Force is preparing an environmental assessment for a proposal to add up to eight C-17 aircraft at Altus AFB. The attachment to this letter describes the proposal and the alternatives being analyzed in accordance with the Council on Environmental Quality guidelines pursuant to the National Environmental Policy Act of 1969. In accordance with Executive Order 12372, Intergovernmental Review of Federal Programs, we request your review and solicit your comments concerning the proposal and any potential environmental consequences of the action.

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Sincerely,

Dan E Staton

DAN E. STATON
Chief, Environmental Flight

Attachment
Description of Proposed Action and Alternatives

DEPARTMENT OF THE AIR FORCE
97th AIR MOBILITY WING
ALTUS AIR FORCE BASE OKLAHOMA

16 DEC 2002

Dan E. Staton
Chief, Environmental Flight
97th Civil Engineer Squadron
401 L Avenue
Altus AFB OK 73523

Board of County Commissioners
Jackson County
101 North Main
Altus, Oklahoma 73521

Dear County Commissioners

The United States Air Force is preparing an environmental assessment for a proposal to add up to eight C-17 aircraft at Altus AFB. The attachment to this letter describes the proposal and the alternatives being analyzed in accordance with the Council on Environmental Quality guidelines pursuant to the National Environmental Policy Act of 1969. In accordance with Executive Order 12372, Intergovernmental Review of Federal Programs, we request your review and solicit your comments concerning the proposal and any potential environmental consequences of the action.

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Sincerely,

Dan E. Staton

DAN E. STATON
Chief, Environmental Flight

Attachment
Description of Proposed Action and Alternatives

DEPARTMENT OF THE AIR FORCE
97th AIR MOBILITY WING
ALTUS AIR FORCE BASE OKLAHOMA

16 DEC 2002

Dan E. Staton
Chief, Environmental Flight
97th Civil Engineer Squadron
401 L Avenue
Altus AFB OK 73523

United States Fish and Wildlife Service
Director, Ecological Services Office
222 South Houston Avenue, Suite A
Tulsa, OK 74127

Dear USFWS Representative

The United States Air Force is preparing an environmental assessment for a proposal to add up to eight C-17 aircraft at Altus AFB. The attachment to this letter describes the proposal and the alternatives being analyzed in accordance with the Council on Environmental Quality guidelines pursuant to the National Environmental Policy Act of 1969. In accordance with Executive Order 12372, Intergovernmental Review of Federal Programs, we request your review and solicit your comments concerning the proposal and any potential environmental consequences of the action.

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Sincerely,

Dan E Staton

DAN E. STATON
Chief, Environmental Flight

Attachment
Description of Proposed Action and Alternatives

Aircraft	Similar Aircraft	Type	Engine	No. Eng.	Engine Reference	EF Reference
C-17	C-17A	Transport (C-17)	F117-PW-100	4	USAF/IERA (2002), p. 32	ERA (2002), p. 36; SOx: p. 25,51 (OK)
T-1	T-1	Trainer	JT15D-4	2	AWST (1992), p. 97	EPA (1992), p. 167
T-38	T-38	T-38	J85-5A	2	Jagelski & O'Brien (1994), p.78	Jagelski & O'Brien (1994), p. 74
T-38A	T-38	T-38	J85-5A	2	Jagelski & O'Brien (1994), p.78	Jagelski & O'Brien (1994), p. 74

Emission Factors

Aircraft	Aircraft Emissions - Sorties (Military Mode) lb/yr					
	Fuel	CO	VOC	NOx	SOx	PM
C-17	55904.0	22.36	1.68	1917.51	95.04	129.14
T-1	2694.0	5.66	0.24	24.87	1.45	2.69
T-38	5260.0	152.54	4.20	13.68	2.84	0.10
T-38A	5260.0	152.54	4.20	13.68	2.84	0.10

Aircraft	Aircraft Emissions - lb/LTOs					
	Fuel	CO	VOC	NOx	SOx	PM
C-17	3871.3	30.20	3.15	62.60	6.58	23.24
T-1	312.6	8.13	3.09	2.28	0.17	0.31
T-38	587.7	62.53	9.38	1.10	0.32	0.01
T-38A	587.7	62.53	9.38	1.10	0.32	0.01

Aircraft	Aircraft Emissions - lb/TGOs					
	Fuel	CO	VOC	NOx	SOx	PM
C-17	2701.1	2.28	0.63	57.96	4.59	10.91
T-1	235.6	0.66	0.01	2.07	0.13	0.24
T-38	299.7	11.27	0.74	0.72	0.16	0.00
T-38A	299.7	11.27	0.74	0.72	0.16	0.00

Percent fo MTRs in each county by total length in miles (Source: NIMA, 2003)

MTR	County	State	Length of MTR in County (mi)	Total Length of MTR (mi)	% of MTR in County	AQCR
IR103	Archer	Texas	34.7	134.8	25.7	210
	Baylor	Texas	17.4		12.9	210
	Jack	Texas	21.6		16.0	210
	Kiowa	Oklahoma	3.7		2.7	189
	Tillman	Oklahoma	30.9		22.9	189
	Wilbarger	Texas	26.6		19.7	210
IR154	Briscoe	Texas	30.7	252.9	12.1	211
	Cottle	Texas	4.3		1.7	210
	Crosby	Texas	1.3		0.5	211
	Dickens	Texas	31.4		12.4	211
	Fisher	Texas	9.1		3.6	210
	Floyd	Texas	33.5		13.2	211
	Garza	Texas	12.4		4.9	211
	Hall	Texas	30.1		11.9	211
	Kent	Texas	45.5		18.0	210
	Motley	Texas	31.7		12.5	211
	Stonewall	Texas	22.8		9.0	210
IR155	Armstrong	Texas	36.3	245.6	14.8	211
	Briscoe	Texas	30.9		12.6	211
	Cottle	Texas	9.9		4.0	210
	Crosby	Texas	17.2		7.0	211
	Dickens	Texas	16.3		6.6	211
	Donley	Texas	37.7		15.4	211
	Floyd	Texas	33.7		13.7	211
	Hall	Texas	30.8		12.5	211
	Motley	Texas	32.9		13.4	211
SR205	Beckham	Oklahoma	28.7	101.2	28.3	189
	Childress	Texas	6.7		6.6	211
	Greer	Oklahoma	24.1		23.8	189
	Hardeman	Texas	2.2		2.2	210
	Harmon	Oklahoma	33.1		32.7	189
	Kiowa	Oklahoma	2.8		2.8	189
	Washita	Oklahoma	3.6		3.6	189

SR206	Childress	Texas	33.1	113.9	29.0	211
	Collingsworth	Texas	41.0		36.0	211
	Hardeman	Texas	10.7		9.4	210
	Harmon	Oklahoma	24.5		21.5	189
	Wheeler	Texas	4.6		4.0	211
SR208	Childress	Texas	31.9	133.3	23.9	211
	Collingsworth	Texas	30.2		22.6	211
	Hardeman	Texas	10.5		7.9	210
	Harmon	Oklahoma	60.8		45.6	189

Percent fo MTRs in each county by total length in miles (Source: NIMA, 2003)

MTR	County	State	Length of MTR in County (mi)	Total Length of MTR (mi)	% of MTR in County	AQCR
SR216	Beckham	Oklahoma	20.2	127.5	15.8	189
	Childress	Texas	6.7		5.2	211
	Collingsworth	Texas	14.9		11.7	211
	Donley	Texas	3.9		3.0	211
	Greer	Oklahoma	24.4		19.1	189
	Hardeman	Texas	2.2		1.7	210
	Harmon	Oklahoma	33.1		25.9	189
	Wheeler	Texas	22.3		17.5	211
SR217	Beckham	Oklahoma	18.8	131.2	14.3	189
	Childress	Texas	13.2		10.1	211
	Collingsworth	Texas	19.2		14.7	211
	Greer	Oklahoma	17.5		13.3	189
	Hardeman	Texas	4.4		3.3	210
	Harmon	Oklahoma	58.1		44.3	189
VR144	Greer	Oklahoma	38.6	113.2	34.1	189
	Hardeman	Texas	34.1		30.1	210
	Harmon	Oklahoma	2.2		1.9	189
	Jackson	Oklahoma	24.2		21.4	189
	Wilbarger	Texas	14.1		12.5	210
VR184	Greer	Oklahoma	39.8	113.7	35.0	189
	Hardeman	Texas	34.1		29.9	210
	Harmon	Oklahoma	1.3		1.1	189
	Jackson	Oklahoma	24.4		21.5	189
	Wilbarger	Texas	14.1		12.4	210
VR190	Beckham	Oklahoma	13.5	206.7	6.5	189
	Childress	Texas	40.6		19.6	211
	Collingsworth	Texas	23.2		11.2	211
	Cottle	Texas	4.9		2.3	210
	Donley	Texas	15.2		7.3	211
	Foard	Texas	16.0		7.8	210
	Greer	Oklahoma	23.3		11.3	189
	Hall	Texas	1.5		0.7	211
	Hardeman	Texas	26.0		12.6	210

	Jackson	Oklahoma	0.6		0.3	189
	Wheeler	Texas	27.8		13.4	211
	Wilbarger	Texas	14.1		6.8	210
VR191	Beckham	Oklahoma	13.5	206.7	6.5	189
	Childress	Texas	40.6		19.6	211
	Collingsworth	Texas	23.2		11.2	211
	Cottle	Texas	4.9		2.3	210
	Donley	Texas	15.2		7.3	211
	Foard	Texas	16.0		7.8	210
	Greer	Oklahoma	23.3		11.3	189
	Hall	Texas	1.5		0.7	211
	Hardeman	Texas	26.0		12.6	210
	Jackson	Oklahoma	0.6		0.3	189
	Wheeler	Texas	27.8		13.4	211
	Wilbarger	Texas	14.1		6.8	210

Percent fo MTRs in each county by total length in miles (Source: NIMA, 2003)

MTR	County	State	Length of MTR in County (mi)	Total Length of MTR (mi)	% of MTR in County	AQCR
VR198	Beckham	Oklahoma	21.3	224.9	9.5	189
	Childress	Texas	25.5		11.3	211
	Collingsworth	Texas	19.3		8.6	211
	Donley	Texas	12.5		5.6	211
	Gray	Texas	26.5		11.8	211
	Greer	Oklahoma	21.7		9.6	189
	Hall	Texas	1.5		0.6	211
	Harmon	Oklahoma	19.3		8.6	189
	Hemphill	Texas	20.6		9.2	211
	Jackson	Oklahoma	18.9		8.4	189
	Roger Mills	Oklahoma	23.3		10.4	187
	Wheeler	Texas	13.0		5.8	211
	Wilbarger	Texas	1.5		0.7	210
VR199	Beckham	Oklahoma	21.3	224.9	9.5	189
	Childress	Texas	25.5		11.3	211
	Collingsworth	Texas	19.3		8.6	211
	Donley	Texas	12.5		5.6	211
	Gray	Texas	26.5		11.8	211
	Greer	Oklahoma	21.7		9.6	189
	Hall	Texas	1.5		0.6	211
	Harmon	Oklahoma	19.3		8.6	189
	Hemphill	Texas	20.6		9.2	211
	Jackson	Oklahoma	18.9		8.4	189
	Roger Mills	Oklahoma	23.3		10.4	187
	Wheeler	Texas	13.0		5.8	211
	Wilbarger	Texas	1.5		0.7	210

Proposed Peak LTO+TGO

Arrivals and Departures (LTO)

		Day LTO C-17	C-5	KC-135	Night LTO C-17	C-5	KC-135	Total LTO C-17	C-5	KC-135	Grand Total LTO C-17	C-5	KC-135
Altus	**Dep**	5248	1432	3024	1916	0	0	7164	1432	3024	7164	1432	3024
Altus	**Arr**	4786	1234	2478	2378	198	546	7164	1432	3024			
Amarillo	**Dep**	0	0	0	0	0	0	0	0	0	0	0	0
Amarillo	**Arr**	0	0	0	0	0	0	0	0	0			
CSIA	**Dep**	0	0	0	0	0	0	0	0	0	0	0	0
CSIA	**Arr**	0	0	0	0	0	0	0	0	0			
Lubbock	**Dep**	0	0	0	0	0	0	0	0	0	0	0	0
Lubbock	**Arr**	0	0	0	0	0	0	0	0	0			

Closed Pattern Operations (TGO)

		Day TGO			Night LTO			Total TGO			Grand Total TGO		
(VFR)		**C-17**	**C-5**	**KC-135**	**C-17**	**C-5**	**KC-135**	**C-17**	**C-5**	**KC-135**	**C-17**	**C-5**	**KC-135**
Altus	**VFR**	16,086	705	992	6,323	10	219	22,409	715	1,211	28,554	1,145	2,971
Altus	**IFR**	4,424	426	1,487	1,721	4	273	6,145	430	1,760			
Amarillo	**VFR**	1,616	1,411	1,982	628	22	437	2,244	1,433	2,419	2,790	2,293	5,939
Amarillo	**IFR**	393	852	2,974	153	8	546	546	860	3,520			
CSIA	**VFR**	-	2,116	1,982	-	-	-	-	2,116	1,982	-	3,394	4,956
CSIA	**IFR**	-	1,278	2,974	-	-	-	-	1,278	2,974			
Lubbock	**VFR**	202	-	-	79	-	-	281	-	-	349	-	-
Lubbock	**IFR**	49	-	-	19	-	-	68	-	-			

Proposed End LTO+TGO

Arrivals and Departures (LTO)

		Day LTO			Night LTO			Total LTO			Grand Total LTO		
		C-17	C-5	KC-135	C-17	C-5	KC-135	C-17	C-5	KC-135	C-17	C-5	KC-135
Altus	Dep	5248	0	3024	1916	0	0	7164	0	3024	7164	0	3024
Altus	Arr	4786	0	2478	2378	0	546	7164	0	3024			
Amarillo	Dep	0	0	0	0	0	0	0	0	0	0	0	0
Amarillo	Arr	0	0	0	0	0	0	0	0	0			
CSIA	Dep	0	0	0	0	0	0	0	0	0	0	0	0
CSIA	Arr	0	0	0	0	0	0	0	0	0			
Lubbock	Dep	0	0	0	0	0	0	0	0	0	0	0	0
Lubbock	Arr	0	0	0	0	0	0	0	0	0			

Closed Pattern Operations (TGO)

		Day TGO			Night LTO			Total TGO			Grand Total TGO		
(VFR)		C-17	C-5	KC-135	C-17	C-5	KC-135	C-17	C-5	KC-135	C-17	C-5	KC-135
Altus	VFR	16,086	-	1,983	6,323	-	437	22,409	-	2,420	28,554	-	5,940
Altus	IFR	4,424	-	2,974	1,721	-	546	6,145	-	3,520			
Amarillo	VFR	1,616	-	2,974	628	-	655	2,244	-	3,629	2,790	-	8,908
Amarillo	IFR	393	-	4,460	153	-	819	546	-	5,279			
CSIA	VFR	-	-	2,974	-	-	-	-	-	2,974	-	-	7,434
CSIA	IFR	-	-	4,460	-	-	-	-	-	4,460			
Lubbock	VFR	202	-	-	79	-	-	281	-	-	349	-	-
Lubbock	IFR	49	-	-	19	-	-	68	-	-			

Arrivals and Departures (LTO)

		Day LTO			Night LTO			Total LTO			Grand Total LTO		
		C-17	C-5	KC-135	C-17	C-5	KC-135	C-17	C-5	KC-135	C-17	C-5	KC-135
Altus	Dep	2993	430	3024	1039	0	0	4032	430	3024	4032	430	3024
Altus	Arr	2531	370	2478	1501	59	546	4032	429	3024			
Amarillo	Dep	0	0	0	0	0	0	0	0	0	0	0	0
Amarillo	Arr	0	0	0	0	0	0	0	0	0			
CSIA	Dep	0	0	0	0	0	0	0	0	0	0	0	0
CSIA	Arr	0	0	0	0	0	0	0	0	0			
Lubbock	Dep	0	0	0	0	0	0	0	0	0	0	0	0
Lubbock	Arr	0	0	0	0	0	0	0	0	0			

Closed Pattern Operations (TGO)

		Day TGO			Nite TGO			Total TGO			Grand Total TGO		
(VFR)		C-17	C-5	KC-135	C-17	C-5	KC-135	C-17	C-5	KC-135	C-17	C-5	KC-135
Altus	VFR	6,992	2,116	5,948	2,786	33	1,310	9,778	2,149	7,258	15,923	3,438	17,817
Altus	IFR	4,424	1,278	8,921	1,721	11	1,638	6,145	1,289	10,559			
Amarillo	VFR	1,616	1,411	992	628	22	219	2,244	1,433	1,211	2,790	2,293	2,971
Amarillo	IFR	393	852	1,487	153	8	273	546	860	1,760			
CSIA	VFR	-	2,116	1,982	-	-	-	-	2,116	1,982	-	3,394	4,956
CSIA	IFR	-	1,278	2,974	-	-	-	-	1,278	2,974			
Lubbock	VFR	202	-	-	79	-	-	281	-	-	349	-	-
Lubbock	IFR	49	-	-	19	-	-	68	-	-			

Arrivals and Departures (LTO)

		Day LTO			Nite LTO			Total LTO			Grand Total LTO		
		C-17	C-5	KC-135	C-17	C-5	KC-135	C-17	C-5	KC-135	C-17	C-5	KC-135
Altus	Dep	2993	0	3024	1039	0	0	4032	0	3024	4032	0	3024
Altus	Arr	2531	0	2478	1501	0	546	4032	0	3024			
Amarillo	Dep	0	0	0	0	0	0	0	0	0	0	0	0
Amarillo	Arr	0	0	0	0	0	0	0	0	0			
CSIA	Dep	0	0	0	0	0	0	0	0	0	0	0	0
CSIA	Arr	0	0	0	0	0	0	0	0	0			
Lubbock	Dep	0	0	0	0	0	0	0	0	0	0	0	0
Lubbock	Arr	0	0	0	0	0	0	0	0	0			

Closed Pattern Operations (TGO)

		Day LTO			Nite TGO			Total TGO			Grand Total TGO		
		C-17	C-5	KC-135	C-17	C-5	KC-135	C-17	C-5	KC-135	C-17	C-5	KC-135
Altus	VFR	6,992	0	6,938	2,786	0	1,504	9,778	-	8,442	15,923	-	20,761
Altus	IFR	4,424	0	10,408	1,721	0	1,911	6,145	-	12,319			
Amarillo	VFR	-	0	1,982	-	0	437	-	-	2,419	-	-	5,939
Amarillo	IFR	-	0	2,974	-	0	546	-	-	3,520			
CSIA	VFR	-	0	2,974	-	0	-	-	-	2,974	-	-	7,434
CSIA	IFR	-	0	4,460	-	0	-	-	-	4,460			
Lubbock	VFR	202	0	-	79	0	-	281	-	-	349	-	-
Lubbock	IFR	49	0	0	19	0	0	68	0	0			

C-17								Emissions				
	Current Usage (sorties per month)							CO	VOC	NOx	SOx	PM
MTR	Day	Night	Total per month	Sorties per year	Length (nmi)	Speed (nmi/hr)	Time (hrs/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)
SR-205	1	0	1	12	101.2	250	5	0.1	0.0	4.7	0.2	0.3
SR-206	1	0	1	12	113.9	250	5	0.1	0.0	5.2	0.3	0.4
SR-208	1	0	1	12	133.3	250	6	0.1	0.0	6.1	0.3	0.4
SR-216	3	1	4	48	127.5	250	24	0.3	0.0	23.5	1.2	1.6
SR-217	55	20	75	900	131.2	250	472	5.3	0.4	452.7	22.4	30.5
VR-144	3	2	5	60	113.2	250	27	0.3	0.0	26.0	1.3	1.8
VR-144 ext	0	0	0	0	113.2	250	0	0.0	0.0	0.0	0.0	0.0
VR-184	33	20	53	636	113.7	250	289	3.2	0.2	277.4	13.8	18.7
VR-190	55	20	75	900	206.7	250	744	8.3	0.6	713.4	35.4	48.0
VR-191	6	2	8	96	206.7	250	79	0.9	0.1	76.1	3.8	5.1
VR-198	1	0	1	12	224.9	250	11	0.1	0.0	10.4	0.5	0.7
VR-199	1	0	1	12	224.9	250	11	0.1	0.0	10.4	0.5	0.7
IR-103	22	0	22	132	134.8	250	71	0.8	0.1	68.2	3.4	4.6
IR-154	2	0	2	12	252.9	250	12	0.1	0.0	11.6	0.6	0.8
IR-155	4	0	4	24	245.6	250	24	0.3	0.0	22.6	1.1	1.5
							1782	**19.9**	**1.5**	**1708.4**	**84.7**	**115.1**

Scaling factor for IR routes: 0.5

								Emissions				
	FY 11 Usage (sorties per month)							CO	VOC	NOx	SOx	PM
	Day	Night	Total per month	Sorties per year	Length (nmi)	Speed (nmi/hr)	Time (hrs/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)
SR-205	3	0	3	36	101.2	250	15	0.2	0.0	14.0	0.7	0.9
SR-206	3	0	3	36	113.9	250	16	0.2	0.0	15.7	0.8	1.1
SR-208	3	0	3	36	133.3	250	19	0.2	0.0	18.4	0.9	1.2
SR-216	5	0	5	60	127.5	250	31	0.3	0.0	29.3	1.5	2.0
SR-217	83	30	113	1356	131.2	250	711	8.0	0.6	682.1	33.8	45.9
VR-144	5	3	8	96	113.2	250	43	0.5	0.0	41.7	2.1	2.8
VR-144	0	0	0	0	113.2	250	0	0.0	0.0	0.0	0.0	0.0
VR-184	50	30	80	960	113.7	250	437	4.9	0.4	418.8	20.8	28.2
VR-190	83	30	113	1356	206.7	250	1121	12.5	0.9	1074.9	53.3	72.4
VR-191	9	4	13	156	206.7	250	129	1.4	0.1	123.7	6.1	8.3

VR-198	3	0	3	36	224.9	250	32	0.4	0.0	31.1	1.5	2.1
VR-199	3	0	3	36	224.9	250	32	0.4	0.0	31.1	1.5	2.1
IR-103	33	0	33	198	134.8	250	107	1.2	0.1	102.4	5.1	6.9
IR-154	4	0	4	24	252.9	250	24	0.3	0.0	23.3	1.2	1.6
IR-155	4	0	4	24	245.6	250	24	0.3	0.0	22.6	1.1	1.5
							2742	**30.7**	**2.3**	**2628.8**	**130.3**	**177.0**

MTR Proposed (C-17)

C-17			Increase in Emissions				
			CO	VOC	NOx	SOx	PM
	Sortie Increase	Time (hrs/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)
SR-205	24	10	0.1	0.0	9.3	0.5	0.6
SR-206	24	11	0.1	0.0	10.5	0.5	0.7
SR-208	24	13	0.1	0.0	12.3	0.6	0.8
SR-216	12	6	0.1	0.0	5.9	0.3	0.4
SR-217	456	239	2.7	0.2	229.4	11.4	15.4
VR-144	36	16	0.2	0.0	15.6	0.8	1.1
VR-144	0	0	0.0	0.0	0.0	0.0	0.0
VR-184	324	147	1.6	0.1	141.3	7.0	9.5
VR-190	456	377	4.2	0.3	361.5	17.9	24.3
VR-191	60	50	0.6	0.0	47.6	2.4	3.2
VR-198	24	22	0.2	0.0	20.7	1.0	1.4
VR-199	24	22	0.2	0.0	20.7	1.0	1.4
IR-103	66	36	0.4	0.0	34.1	1.7	2.3
IR-154	12	12	0.1	0.0	11.6	0.6	0.8
IR-155	0	0	0.0	0.0	0.0	0.0	0.0
	1542	**960**	**10.7**	**0.8**	**920.5**	**45.6**	**62.0**

MTR Proposed (T-1)

T-1								**Emissions**				
	Current Usage (sorties per month)							**CO**	**VOC**	**NOx**	**SOx**	**PM**
MTR	**Day**	**Night**	**Total per month**	**Sorties per year**	**Length (nmi)**	**Speed (nmi/hr)**	**Time (hrs/yr)**	**(tons/yr)**	**(tons/yr)**	**(tons/yr)**	**(tons/yr)**	**(tons/yr)**
SR-205	0	0	0	0	101.2	160	0	0.0	0.0	0.0	0.0	0.0
SR-206	0	0	0	0	113.9	160	0	0.0	0.0	0.0	0.0	0.0
SR-208	0	0	0	0	133.3	160	0	0.0	0.0	0.0	0.0	0.0
SR-216	0	0	0	0	127.5	160	0	0.0	0.0	0.0	0.0	0.0
SR-217	0	0	0	0	131.2	160	0	0.0	0.0	0.0	0.0	0.0
VR-144	0	0	0	0	113.2	160	0	0.0	0.0	0.0	0.0	0.0
VR-144 ext	0	0	0	0	113.2	160	0	0.0	0.0	0.0	0.0	0.0
VR-184	0	0	0	0	113.7	160	0	0.0	0.0	0.0	0.0	0.0
VR-190	0	0	0	0	206.7	160	0	0.0	0.0	0.0	0.0	0.0
VR-191	0	0	0	0	206.7	160	0	0.0	0.0	0.0	0.0	0.0
VR-198	0	0	0	0	224.9	160	0	0.0	0.0	0.0	0.0	0.0
VR-199	0	0	0	0	224.9	160	0	0.0	0.0	0.0	0.0	0.0
IR-103	0	0	0	0	134.8	160	0	0.0	0.0	0.0	0.0	0.0
IR-154	0	0	0	0	252.9	160	0	0.0	0.0	0.0	0.0	0.0
IR-155	0	0	0	0	245.6	160	0	0.0	0.0	0.0	0.0	0.0
							0	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

Scaling factor for IR routes: 0.5

								Emissions				
	FY 11 Usage (sorties per month)							**CO**	**VOC**	**NOx**	**SOx**	**PM**
	Day	**Night**	**Total per month**	**Sorties per year**	**Length (nmi)**	**Speed (nmi/hr)**	**Time (hrs/yr)**	**(tons/yr)**	**(tons/yr)**	**(tons/yr)**	**(tons/yr)**	**(tons/yr)**
SR-205	1	0	1	12	101.2	160	8	0.0	0.0	0.1	0.0	0.0
SR-206	1	0	1	12	113.9	160	9	0.0	0.0	0.1	0.0	0.0
SR-208	1	0	1	12	133.3	160	10	0.0	0.0	0.1	0.0	0.0
SR-216	1	0	1	12	127.5	160	10	0.0	0.0	0.1	0.0	0.0
SR-217	1	0	1	12	131.2	160	10	0.0	0.0	0.1	0.0	0.0
VR-144	1	0	1	12	113.2	160	8	0.0	0.0	0.1	0.0	0.0
VR-144 ext			0	0	113.2	160	0	0.0	0.0	0.0	0.0	0.0
VR-184	1	0	1	12	113.7	160	9	0.0	0.0	0.1	0.0	0.0
VR-190	1	0	1	12	206.7	160	16	0.0	0.0	0.2	0.0	0.0
VR-191	1	0	1	12	206.7	160	16	0.0	0.0	0.2	0.0	0.0

MTR Proposed (T-1)

VR-198	1	0	1	12	224.9	160	17	0.0	0.0	0.2	0.0	0.0
VR-199	1	0	1	12	224.9	160	17	0.0	0.0	0.2	0.0	0.0
IR-103	1	0	1	6	134.8	160	5	0.0	0.0	0.1	0.0	0.0
IR-154	1	0	1	6	252.9	160	9	0.0	0.0	0.1	0.0	0.0
IR-155	1	0	1	6	245.6	160	9	0.0	0.0	0.1	0.0	0.0
							151	**0.4**	**0.0**	**1.9**	**0.1**	**0.2**

MTR Proposed (T-1)

T-1			Increase in Emissions				
			CO	VOC	NOx	SOx	PM
	Sortie Increase	Time (hrs/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)
SR-205	12	8	0.0	0.0	0.1	0.0	0.0
SR-206	12	9	0.0	0.0	0.1	0.0	0.0
SR-208	12	10	0.0	0.0	0.1	0.0	0.0
SR-216	12	10	0.0	0.0	0.1	0.0	0.0
SR-217	12	10	0.0	0.0	0.1	0.0	0.0
VR-144	12	8	0.0	0.0	0.1	0.0	0.0
VR-144 ext	0	0	0.0	0.0	0.0	0.0	0.0
VR-184	12	9	0.0	0.0	0.1	0.0	0.0
VR-190	12	16	0.0	0.0	0.2	0.0	0.0
VR-191	12	16	0.0	0.0	0.2	0.0	0.0
VR-198	12	17	0.0	0.0	0.2	0.0	0.0
VR-199	12	17	0.0	0.0	0.2	0.0	0.0
IR-103	6	5	0.0	0.0	0.1	0.0	0.0
IR-154	6	9	0.0	0.0	0.1	0.0	0.0
IR-155	6	9	0.0	0.0	0.1	0.0	0.0
	150	**151**	**0.4**	**0.0**	**1.9**	**0.1**	**0.2**

MTR Proposed (T-38)

T-38								Emissions				
	Current Usage (sorties per month)							CO	VOC	NOx	SOx	PM
MTR	Day	Night	Total per month	Sorties per year	Length (nmi)	Speed (nmi/hr)	Time (hrs/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)
SR-205	0	0	0	0	101.2	250	0	0.0	0.0	0.0	0.0	0.0
SR-206	0	0	0	0	113.9	250	0	0.0	0.0	0.0	0.0	0.0
SR-208	0	0	0	0	133.3	250	0	0.0	0.0	0.0	0.0	0.0
SR-216	0	0	0	0	127.5	250	0	0.0	0.0	0.0	0.0	0.0
SR-217	0	0	0	0	131.2	250	0	0.0	0.0	0.0	0.0	0.0
VR-144	0	0	0	0	113.2	301	0	0.0	0.0	0.0	0.0	0.0
VR-144 ext	0	0	0	0	113.2	301	0	0.0	0.0	0.0	0.0	0.0
VR-184	0	0	0	0	113.7	301	0	0.0	0.0	0.0	0.0	0.0
VR-190	0	0	0	0	206.7	301	0	0.0	0.0	0.0	0.0	0.0
VR-191	0	0	0	0	206.7	301	0	0.0	0.0	0.0	0.0	0.0
VR-198	0	0	0	0	224.9	301	0	0.0	0.0	0.0	0.0	0.0
VR-199	0	0	0	0	224.9	301	0	0.0	0.0	0.0	0.0	0.0
IR-103	0	0	0	0	134.8	301	0	0.0	0.0	0.0	0.0	0.0
IR-154	0	0	0	0	252.9	301	0	0.0	0.0	0.0	0.0	0.0
IR-155	0	0	0	0	245.6	301	0	0.0	0.0	0.0	0.0	0.0
							0	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

MTR Proposed (T-38)

Scaling factor for IR routes: 0.5

								Emissions				
	FY 11 Usage (sorties per month)							CO	VOC	NOx	SOx	PM
	Day	Night	Total per month	Sorties per year	Length (nmi)	Speed (nmi/hr)	Time (hrs/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)
SR-205	1	0	1	12	101.2	250	5	0.4	0.0	0.0	0.0	0.0
SR-206	1	0	1	12	113.9	250	5	0.4	0.0	0.0	0.0	0.0
SR-208	1	0	1	12	133.3	250	6	0.5	0.0	0.0	0.0	0.0
SR-216	1	0	1	12	127.5	250	6	0.5	0.0	0.0	0.0	0.0
SR-217	1	0	1	12	131.2	250	6	0.5	0.0	0.0	0.0	0.0
VR-144	1	0	1	12	113.2	301	5	0.3	0.0	0.0	0.0	0.0
VR-144 ext			0	0	113.2	301	0	0.0	0.0	0.0	0.0	0.0
VR-184	1	0	1	12	113.7	301	5	0.3	0.0	0.0	0.0	0.0
VR-190	1	0	1	12	206.7	301	8	0.6	0.0	0.1	0.0	0.0
VR-191	1	0	1	12	206.7	301	8	0.6	0.0	0.1	0.0	0.0
VR-198	1	0	1	12	224.9	301	9	0.7	0.0	0.1	0.0	0.0
VR-199	1	0	1	12	224.9	301	9	0.7	0.0	0.1	0.0	0.0
IR-103	1	0	1	6	134.8	301	3	0.2	0.0	0.0	0.0	0.0
IR-154	1	0	1	6	252.9	301	5	0.4	0.0	0.0	0.0	0.0
IR-155	1	0	1	6	245.6	301	5	0.4	0.0	0.0	0.0	0.0
							85	**6.5**	**0.2**	**0.6**	**0.1**	**0.0**

MTR Proposed (T-38)

T-38			Increase in Emissions				
			CO	VOC	NOx	SOx	PM
	Sortie Increase	Time (hrs/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)
SR-205	12	5	0.4	0.0	0.0	0.0	0.0
SR-206	12	5	0.4	0.0	0.0	0.0	0.0
SR-208	12	6	0.5	0.0	0.0	0.0	0.0
SR-216	12	6	0.5	0.0	0.0	0.0	0.0
SR-217	12	6	0.5	0.0	0.0	0.0	0.0
VR-144	12	5	0.3	0.0	0.0	0.0	0.0
VR-144 ext	0	0	0.0	0.0	0.0	0.0	0.0
VR-184	12	5	0.3	0.0	0.0	0.0	0.0
VR-190	12	8	0.6	0.0	0.1	0.0	0.0
VR-191	12	8	0.6	0.0	0.1	0.0	0.0
VR-198	12	9	0.7	0.0	0.1	0.0	0.0
VR-199	12	9	0.7	0.0	0.1	0.0	0.0
IR-103	6	3	0.2	0.0	0.0	0.0	0.0
IR-154	6	5	0.4	0.0	0.0	0.0	0.0
IR-155	6	5	0.4	0.0	0.0	0.0	0.0
	150	**85**	**6.5**	**0.2**	**0.6**	**0.1**	**0.0**

MTR Alternative (C-17)

C-17								Emissions				
	Current Usage (sorties per month)							CO	VOC	NOx	SOx	PM
MTR	Day	Night	Total per month	Sorties per year	Length (nmi)	Speed (nmi/hr)	Time (hrs/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)
SR-205	1	0	1	12	101.2	250	5	0.1	0.0	4.7	0.2	0.3
SR-206	1	0	1	12	113.9	250	5	0.1	0.0	5.2	0.3	0.4
SR-208	1	0	1	12	133.3	250	6	0.1	0.0	6.1	0.3	0.4
SR-216	3	1	4	48	127.5	250	24	0.3	0.0	23.5	1.2	1.6
SR-217	55	20	75	900	131.2	250	472	5.3	0.4	452.7	22.4	30.5
VR-144	3	2	5	60	113.2	250	27	0.3	0.0	26.0	1.3	1.8
VR-144 ext	0	0	0	0	113.2	250	0	0.0	0.0	0.0	0.0	0.0
VR-184	33	20	53	636	113.7	250	289	3.2	0.2	277.4	13.8	18.7
VR-190	55	20	75	900	206.7	250	744	8.3	0.6	713.4	35.4	48.0
VR-191	6	2	8	96	206.7	250	79	0.9	0.1	76.1	3.8	5.1
VR-198	1	0	1	12	224.9	250	11	0.1	0.0	10.4	0.5	0.7
VR-199	1	0	1	12	224.9	250	11	0.1	0.0	10.4	0.5	0.7
IR-103	22	0	22	132	134.8	250	71	0.8	0.1	68.2	3.4	4.6
IR-154	2	0	2	12	252.9	250	12	0.1	0.0	11.6	0.6	0.8
IR-155	4	0	4	24	245.6	250	24	0.3	0.0	22.6	1.1	1.5
							1782	**19.9**	**1.5**	**1708.4**	**84.7**	**115.1**

MTR Alternative (C-17)

Scaling factor for IR routes: 0.5

	FY 11 Usage (sorties per month)							Emissions				
								CO	VOC	NOx	SOx	PM
	Day	Night	Total per month	Sorties per year	Length (nmi)	Speed (nmi/hr)	Time (hrs/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)
SR-205	3	0	3	36	101.2	250	15	0.2	0.0	14.0	0.7	0.9
SR-206	3	0	3	36	113.9	250	16	0.2	0.0	15.7	0.8	1.1
SR-208	3	0	3	36	133.3	250	19	0.2	0.0	18.4	0.9	1.2
SR-216	5	0	5	60	127.5	250	31	0.3	0.0	29.3	1.5	2.0
SR-217	83	30	113	1356	131.2	250	711	8.0	0.6	682.1	33.8	45.9
VR-144	5	3	8	96	113.2	250	43	0.5	0.0	41.7	2.1	2.8
VR-144 ext	25	15	40	480	113.2	250	217	2.4	0.2	208.4	10.3	14.0
VR-184	50	30	80	960	113.7	250	437	4.9	0.4	418.8	20.8	28.2
VR-190	83	30	113	1356	206.7	250	1121	12.5	0.9	1074.9	53.3	72.4
VR-191	9	4	13	156	206.7	250	129	1.4	0.1	123.7	6.1	8.3
VR-198	3	0	3	36	224.9	250	32	0.4	0.0	31.1	1.5	2.1
VR-199	3	0	3	36	224.9	250	32	0.4	0.0	31.1	1.5	2.1
IR-103	33	0	33	198	134.8	250	107	1.2	0.1	102.4	5.1	6.9
IR-154	4	0	4	24	252.9	250	24	0.3	0.0	23.3	1.2	1.6
IR-155	4	0	4	24	245.6	250	24	0.3	0.0	22.6	1.1	1.5
				4890			**2959**	**33.1**	**2.5**	**2837.2**	**140.6**	**191.1**

MTR Alternative (C-17)

			Increase in Emissions				
			CO	VOC	NOx	SOx	PM
	Sortie Increase	Time (hrs/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)
	24	10	0.1	0.0	9.3	0.5	0.6
	24	11	0.1	0.0	10.5	0.5	0.7
	24	13	0.1	0.0	12.3	0.6	0.8
	12	6	0.1	0.0	5.9	0.3	0.4
	456	239	2.7	0.2	229.4	11.4	15.4
	36	16	0.2	0.0	15.6	0.8	1.1
	480	217	2.4	0.2	208.4	10.3	14.0
	324	147	1.6	0.1	141.3	7.0	9.5
	456	377	4.2	0.3	361.5	17.9	24.3
	60	50	0.6	0.0	47.6	2.4	3.2
	24	22	0.2	0.0	20.7	1.0	1.4
	24	22	0.2	0.0	20.7	1.0	1.4
	66	36	0.4	0.0	34.1	1.7	2.3
	12	12	0.1	0.0	11.6	0.6	0.8
	0	0	0.0	0.0	0.0	0.0	0.0
	2022	**1177**	**13.2**	**1.0**	**1128.8**	**55.9**	**76.0**

MTR Alternative (T-1)

T-1								Emissions				
	Current Usage (sorties per month)							CO	VOC	NOx	SOx	PM
MTR	Day	Night	Total per month	Sorties per year	Length (nmi)	Speed (nmi/hr)	Time (hrs/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)
SR-205	0	0	0	0	101.2	160	0	0.0	0.0	0.0	0.0	0.0
SR-206	0	0	0	0	113.9	160	0	0.0	0.0	0.0	0.0	0.0
SR-208	0	0	0	0	133.3	160	0	0.0	0.0	0.0	0.0	0.0
SR-216	0	0	0	0	127.5	160	0	0.0	0.0	0.0	0.0	0.0
SR-217	0	0	0	0	131.2	160	0	0.0	0.0	0.0	0.0	0.0
VR-144	0	0	0	0	113.2	160	0	0.0	0.0	0.0	0.0	0.0
VR-144 ext	0	0	0	0	113.2	160	0	0.0	0.0	0.0	0.0	0.0
VR-184	0	0	0	0	113.7	160	0	0.0	0.0	0.0	0.0	0.0
VR-190	0	0	0	0	206.7	160	0	0.0	0.0	0.0	0.0	0.0
VR-191	0	0	0	0	206.7	160	0	0.0	0.0	0.0	0.0	0.0
VR-198	0	0	0	0	224.9	160	0	0.0	0.0	0.0	0.0	0.0
VR-199	0	0	0	0	224.9	160	0	0.0	0.0	0.0	0.0	0.0
IR-103	0	0	0	0	134.8	160	0	0.0	0.0	0.0	0.0	0.0
IR-154	0	0	0	0	252.9	160	0	0.0	0.0	0.0	0.0	0.0
IR-155	0	0	0	0	245.6	160	0	0.0	0.0	0.0	0.0	0.0
							0	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

MTR Alternative (T-1)

Scaling factor for IR routes: 0.5

	FY 11 Usage (sorties per month)							Emissions				
								CO	VOC	NOx	SOx	PM
	Day	Night	Total per month	Sorties per year	Length (nmi)	Speed (nmi/hr)	Time (hrs/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)
SR-205	1	0	1	12	101.2	160	8	0.0	0.0	0.1	0.0	0.0
SR-206	1	0	1	12	113.9	160	9	0.0	0.0	0.1	0.0	0.0
SR-208	1	0	1	12	133.3	160	10	0.0	0.0	0.1	0.0	0.0
SR-216	1	0	1	12	127.5	160	10	0.0	0.0	0.1	0.0	0.0
SR-217	1	0	1	12	131.2	160	10	0.0	0.0	0.1	0.0	0.0
VR-144	1	0	1	12	113.2	160	8	0.0	0.0	0.1	0.0	0.0
VR-144 ext	1	0	1	12	113.2	160	8	0.0	0.0	0.1	0.0	0.0
VR-184	1	0	1	12	113.7	160	9	0.0	0.0	0.1	0.0	0.0
VR-190	1	0	1	12	206.7	160	16	0.0	0.0	0.2	0.0	0.0
VR-191	1	0	1	12	206.7	160	16	0.0	0.0	0.2	0.0	0.0
VR-198	1	0	1	12	224.9	160	17	0.0	0.0	0.2	0.0	0.0
VR-199	1	0	1	12	224.9	160	17	0.0	0.0	0.2	0.0	0.0
IR-103	1	0	1	6	134.8	160	5	0.0	0.0	0.1	0.0	0.0
IR-154	1	0	1	6	252.9	160	9	0.0	0.0	0.1	0.0	0.0
IR-155	1	0	1	6	245.6	160	9	0.0	0.0	0.1	0.0	0.0
							160	**0.5**	**0.0**	**2.0**	**0.1**	**0.2**

MTR Alternative (T-1)

			Increase in Emissions				
			CO	VOC	NOx	SOx	PM
	Sortie Increase	Time (hrs/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)
	12	8	0.0	0.0	0.1	0.0	0.0
	12	9	0.0	0.0	0.1	0.0	0.0
	12	10	0.0	0.0	0.1	0.0	0.0
	12	10	0.0	0.0	0.1	0.0	0.0
	12	10	0.0	0.0	0.1	0.0	0.0
	12	8	0.0	0.0	0.1	0.0	0.0
	12	8	0.0	0.0	0.1	0.0	0.0
	12	9	0.0	0.0	0.1	0.0	0.0
	12	16	0.0	0.0	0.2	0.0	0.0
	12	16	0.0	0.0	0.2	0.0	0.0
	12	17	0.0	0.0	0.2	0.0	0.0
	12	17	0.0	0.0	0.2	0.0	0.0
	6	5	0.0	0.0	0.1	0.0	0.0
	6	9	0.0	0.0	0.1	0.0	0.0
	6	9	0.0	0.0	0.1	0.0	0.0
	162	**160**	**0.5**	**0.0**	**2.0**	**0.1**	**0.2**

MTR Alternative (T-38)

T-38							Emissions					
	Current Usage (sorties per month)							CO	VOC	NOx	SOx	PM
MTR	Day	Night	Total per month	Sorties per year	Length (nmi)	Speed (nmi/hr)	Time (hrs/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)
SR-205	0	0	0	0	101.2	250	0	0.0	0.0	0.0	0.0	0.0
SR-206	0	0	0	0	113.9	250	0	0.0	0.0	0.0	0.0	0.0
SR-208	0	0	0	0	133.3	250	0	0.0	0.0	0.0	0.0	0.0
SR-216	0	0	0	0	127.5	250	0	0.0	0.0	0.0	0.0	0.0
SR-217	0	0	0	0	131.2	250	0	0.0	0.0	0.0	0.0	0.0
VR-144	0	0	0	0	113.2	301	0	0.0	0.0	0.0	0.0	0.0
VR-144 ext	0	0	0	0	113.2	301	0	0.0	0.0	0.0	0.0	0.0
VR-184	0	0	0	0	113.7	301	0	0.0	0.0	0.0	0.0	0.0
VR-190	0	0	0	0	206.7	301	0	0.0	0.0	0.0	0.0	0.0
VR-191	0	0	0	0	206.7	301	0	0.0	0.0	0.0	0.0	0.0
VR-198	0	0	0	0	224.9	301	0	0.0	0.0	0.0	0.0	0.0
VR-199	0	0	0	0	224.9	301	0	0.0	0.0	0.0	0.0	0.0
IR-103	0	0	0	0	134.8	301	0	0.0	0.0	0.0	0.0	0.0
IR-154	0	0	0	0	252.9	301	0	0.0	0.0	0.0	0.0	0.0
IR-155	0	0	0	0	245.6	301	0	0.0	0.0	0.0	0.0	0.0
							0	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

MTR Alternative (T-38)

Scaling factor for IR routes: 0.5

	FY 11 Usage (sorties per month)							Emissions				
								CO	VOC	NOx	SOx	PM
	Day	Night	Total per month	Sorties per year	Length (nmi)	Speed (nmi/hr)	Time (hrs/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)
SR-205	1	0	1	12	101.2	250	5	0.4	0.0	0.0	0.0	0.0
SR-206	1	0	1	12	113.9	250	5	0.4	0.0	0.0	0.0	0.0
SR-208	1	0	1	12	133.3	250	6	0.5	0.0	0.0	0.0	0.0
SR-216	1	0	1	12	127.5	250	6	0.5	0.0	0.0	0.0	0.0
SR-217	1	0	1	12	131.2	250	6	0.5	0.0	0.0	0.0	0.0
VR-144	1	0	1	12	113.2	301	5	0.3	0.0	0.0	0.0	0.0
VR-144 ext	1	0	1	12	113.2	301	5	0.3	0.0	0.0	0.0	0.0
VR-184	1	0	1	12	113.7	301	5	0.3	0.0	0.0	0.0	0.0
VR-190	1	0	1	12	206.7	301	8	0.6	0.0	0.1	0.0	0.0
VR-191	1	0	1	12	206.7	301	8	0.6	0.0	0.1	0.0	0.0
VR-198	1	0	1	12	224.9	301	9	0.7	0.0	0.1	0.0	0.0
VR-199	1	0	1	12	224.9	301	9	0.7	0.0	0.1	0.0	0.0
IR-103	1	0	1	6	134.8	301	3	0.2	0.0	0.0	0.0	0.0
IR-154	1	0	1	6	252.9	301	5	0.4	0.0	0.0	0.0	0.0
IR-155	1	0	1	6	245.6	301	5	0.4	0.0	0.0	0.0	0.0
							90	**6.8**	**0.2**	**0.6**	**0.1**	**0.0**

MTR Alternative (T-38)

			Increase in Emissions				
			CO	VOC	NOx	SOx	PM
	Sortie Increase	Time (hrs/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)
	12	5	0.4	0.0	0.0	0.0	0.0
	12	5	0.4	0.0	0.0	0.0	0.0
	12	6	0.5	0.0	0.0	0.0	0.0
	12	6	0.5	0.0	0.0	0.0	0.0
	12	6	0.5	0.0	0.0	0.0	0.0
	12	5	0.3	0.0	0.0	0.0	0.0
	12	5	0.3	0.0	0.0	0.0	0.0
	12	5	0.3	0.0	0.0	0.0	0.0
	12	8	0.6	0.0	0.1	0.0	0.0
	12	8	0.6	0.0	0.1	0.0	0.0
	12	9	0.7	0.0	0.1	0.0	0.0
	12	9	0.7	0.0	0.1	0.0	0.0
	6	3	0.2	0.0	0.0	0.0	0.0
	6	5	0.4	0.0	0.0	0.0	0.0
	6	5	0.4	0.0	0.0	0.0	0.0
	162	**90**	**6.8**	**0.2**	**0.6**	**0.1**	**0.0**

Proposed Action (Also table 4-16)

	TOTAL				
	Increase in Emissions (Tons/yr)				
MTR	**CO**	**VOC**	**NOx**	**SOx**	**PM**
SR-205	0.5	0.0	9.4	0.5	0.6
SR-206	0.6	0.0	10.6	0.5	0.7
SR-208	0.7	0.0	12.4	0.6	0.8
SR-216	0.6	0.0	6.0	0.3	0.4
SR-217	3.2	0.2	229.5	11.4	15.5
VR-144	0.6	0.0	15.8	0.8	1.1
VR-144 ext	0.0	0.0	0.0	0.0	0.0
VR-184	2.0	0.1	141.5	7.0	9.5
VR-190	4.9	0.3	361.7	17.9	24.4
VR-191	1.2	0.1	47.8	2.4	3.2
VR-198	1.0	0.0	21.0	1.1	1.4
VR-199	1.0	0.0	21.0	1.1	1.4
IR-103	0.6	0.0	34.2	1.7	2.3
IR-154	0.5	0.0	11.8	0.6	0.8
IR-155	0.4	0.0	0.1	0.0	0.0
	17.7	**1.0**	**922.9**	**45.9**	**62.2**

Alternative Action

MTR	TOTAL Increase in Emissions (Tons/yr)				
	CO	VOC	NOx	SOx	PM
SR-205	0.5	0.0	9.4	0.5	0.6
SR-206	0.6	0.0	10.6	0.5	0.7
SR-208	0.7	0.0	12.4	0.6	0.8
SR-216	0.6	0.0	6.0	0.3	0.4
SR-217	3.2	0.2	229.5	11.4	15.5
VR-144	0.6	0.0	15.8	0.8	1.1
VR-144 ext	2.8	0.2	208.5	10.3	14.0
VR-184	2.0	0.1	141.5	7.0	9.5
VR-190	4.9	0.3	361.7	17.9	24.4
VR-191	1.2	0.1	47.8	2.4	3.2
VR-198	1.0	0.0	21.0	1.1	1.4
VR-199	1.0	0.0	21.0	1.1	1.4
IR-103	0.6	0.0	34.2	1.7	2.3
IR-154	0.5	0.0	11.8	0.6	0.8
IR-155	0.4	0.0	0.1	0.0	0.0
	20.5	**1.2**	**1131.4**	**56.2**	**76.2**

AQCR 187					AQCR 189				
Increase in Emissions (tons/yr)					Increase in Emissions (tons/yr)				
CO	**VOC**	**NOx**	**SOx**	**PM**	**CO**	**VOC**	**NOx**	**SOx**	**PM**
0.0	0.0	0.0	0.0	0.0	0.5	0.0	8.6	0.4	0.6
0.0	0.0	0.0	0.0	0.0	0.1	0.0	2.3	0.1	0.2
0.0	0.0	0.0	0.0	0.0	0.3	0.0	5.7	0.3	0.4
0.0	0.0	0.0	0.0	0.0	0.3	0.0	3.7	0.2	0.2
0.0	0.0	0.0	0.0	0.0	2.3	0.2	165.1	8.2	11.1
0.0	0.0	0.0	0.0	0.0	0.3	0.0	9.1	0.5	0.6
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	1.2	0.1	81.5	4.0	5.5
0.0	0.0	0.0	0.0	0.0	0.9	0.1	65.5	3.2	4.4
0.0	0.0	0.0	0.0	0.0	0.2	0.0	8.7	0.4	0.6
0.1	0.0	2.2	0.1	0.1	0.4	0.0	7.6	0.4	0.5
0.1	0.0	2.2	0.1	0.1	0.4	0.0	7.6	0.4	0.5
0.0	0.0	0.0	0.0	0.0	0.2	0.0	8.8	0.4	0.6
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.2	**0.0**	**4.4**	**0.2**	**0.3**	**7.0**	**0.4**	**374.0**	**18.6**	**25.2**

AQCR 187					AQCR 189				
Increase in Emissions (tons/yr)					Increase in Emissions (tons/yr)				
CO	**VOC**	**NOx**	**SOx**	**PM**	**CO**	**VOC**	**NOx**	**SOx**	**PM**
0.0	0.0	0.0	0.0	0.0	0.5	0.0	8.6	0.4	0.6
0.0	0.0	0.0	0.0	0.0	0.1	0.0	2.3	0.1	0.2
0.0	0.0	0.0	0.0	0.0	0.3	0.0	5.7	0.3	0.4
0.0	0.0	0.0	0.0	0.0	0.3	0.0	3.7	0.2	0.2
0.0	0.0	0.0	0.0	0.0	2.3	0.2	165.1	8.2	11.1
0.0	0.0	0.0	0.0	0.0	0.3	0.0	9.1	0.5	0.6
0.0	0.0	0.0	0.0	0.0	1.6	0.1	119.7	5.9	8.1
0.0	0.0	0.0	0.0	0.0	1.2	0.1	81.5	4.0	5.5
0.0	0.0	0.0	0.0	0.0	0.9	0.1	65.5	3.2	4.4
0.0	0.0	0.0	0.0	0.0	0.2	0.0	8.7	0.4	0.6
0.1	0.0	2.2	0.1	0.1	0.4	0.0	7.6	0.4	0.5
0.1	0.0	2.2	0.1	0.1	0.4	0.0	7.6	0.4	0.5
0.0	0.0	0.0	0.0	0.0	0.2	0.0	8.8	0.4	0.6
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.2	**0.0**	**4.4**	**0.2**	**0.3**	**8.6**	**0.5**	**493.7**	**24.5**	**33.3**

AQCR 210					AQCR 211				
Increase in Emissions (tons/yr)					Increase in Emissions (tons/yr)				
CO	**VOC**	**NOx**	**SOx**	**PM**	**CO**	**VOC**	**NOx**	**SOx**	**PM**
0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.6	0.0	0.0
0.1	0.0	1.0	0.1	0.1	0.4	0.0	7.3	0.4	0.5
0.1	0.0	1.0	0.0	0.1	0.3	0.0	5.8	0.3	0.4
0.0	0.0	0.1	0.0	0.0	0.2	0.0	2.3	0.1	0.2
0.1	0.0	7.7	0.4	0.5	0.8	0.1	56.7	2.8	3.8
0.2	0.0	6.7	0.3	0.5	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.9	0.1	59.9	3.0	4.0	0.0	0.0	0.0	0.0	0.0
1.4	0.1	106.9	5.3	7.2	2.6	0.2	189.4	9.4	12.8
0.4	0.0	14.1	0.7	1.0	0.6	0.0	25.0	1.2	1.7
0.0	0.0	0.1	0.0	0.0	0.5	0.0	11.1	0.6	0.7
0.0	0.0	0.1	0.0	0.0	0.5	0.0	11.1	0.6	0.7
0.5	0.0	25.4	1.3	1.7	0.0	0.0	0.0	0.0	0.0
0.2	0.0	3.8	0.2	0.3	0.4	0.0	8.0	0.4	0.5
0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.1	0.0	0.0
3.8	**0.2**	**227.1**	**11.3**	**15.3**	**6.7**	**0.4**	**317.5**	**15.8**	**21.4**

AQCR 210					AQCR 211				
Increase in Emissions (tons/yr)					Increase in Emissions (tons/yr)				
CO	**VOC**	**NOx**	**SOx**	**PM**	**CO**	**VOC**	**NOx**	**SOx**	**PM**
0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.6	0.0	0.0
0.1	0.0	1.0	0.1	0.1	0.4	0.0	7.3	0.4	0.5
0.1	0.0	1.0	0.0	0.1	0.3	0.0	5.8	0.3	0.4
0.0	0.0	0.1	0.0	0.0	0.2	0.0	2.3	0.1	0.2
0.1	0.0	7.7	0.4	0.5	0.8	0.1	56.7	2.8	3.8
0.2	0.0	6.7	0.3	0.5	0.0	0.0	0.0	0.0	0.0
1.2	0.1	88.8	4.4	6.0	0.0	0.0	0.0	0.0	0.0
0.9	0.1	59.9	3.0	4.0	0.0	0.0	0.0	0.0	0.0
1.4	0.1	106.9	5.3	7.2	2.6	0.2	189.4	9.4	12.8
0.4	0.0	14.1	0.7	1.0	0.6	0.0	25.0	1.2	1.7
0.0	0.0	0.1	0.0	0.0	0.5	0.0	11.1	0.6	0.7
0.0	0.0	0.1	0.0	0.0	0.5	0.0	11.1	0.6	0.7
0.5	0.0	25.4	1.3	1.7	0.0	0.0	0.0	0.0	0.0
0.2	0.0	3.8	0.2	0.3	0.4	0.0	8.0	0.4	0.5
0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.1	0.0	0.0
5.0	**0.3**	**315.9**	**15.7**	**21.3**	**6.7**	**0.4**	**317.5**	**15.8**	**21.4**

Table 4-15,-21,-31,-51

Emissions Summary

Proposed Action					
Source	**Emissions (tons/year)**				
	CO	**VOC**	**NOx**	**SOx**	**PM**
FY03 Construction (Infrastructure)	0.1	0.0	0.6	0.0	0.0
Grading					0.002
Total Construction (FY03)	**0.1**	**0.04**	**0.6**	**0.0**	**0.04**
FY04 Construction (Infrastructure)	0.1	0.0	0.5	0.0	0.0
Grading					0.0
Total Construction (FY04)	**0.1**	**0.03**	**0.5**	**0.0**	**0.04**
FY05 Construction (Infrastructure)	0.1	0.0	0.3	0.0	0.0
Grading					0.0
Total Construction (FY05)	**0.1**	**0.02**	**0.3**	**0.0**	**0.02**
FY06 Construction (Infrastructure)	0.3	0.1	1.2	0.0	0.1
Grading					0.0
Total Construction (FY06)	**0.3**	**0.1**	**1.2**	**0.0**	**0.1**
FY07Construction (Infrastructure)	9.0	2.8	41.5	0.0	2.9
Grading					0.6
Paving (Parking)	1.8	2.7	9.4	0.1	0.8
Total Construction (FY07)	**10.8**	**5.5**	**50.9**	**0.1**	**4.3**
FY10 Construction (Infrastructure)	9.7	3.0	44.6	0.0	3.2
Grading					0.1
Total Construction (FY10)	**9.7**	**3.0**	**44.6**	**0.0**	**3.3**

Source	**Emissions (tons/year)**				
	CO	**VOC**	**NOx**	**SOx**	**PM**
Commuting POV	39.7	5.9	3.9	0.0	0.2
Total Commuting POV	**39.7**	**5.9**	**3.9**	**0.0**	**0.2**

Alternative Action						
Source	**CO**	**VOC**	**NOx**	**SOx**	**PM**	
FY03 Construction (Infrastructure)	0.1	0.0	0.6	0.0	0.0	
Grading					0.0	
Total Construction (FY03)	**0.1**	**0.04**	**0.6**	**0.00**	**0.04**	
FY04 Construction (Infrastructure)	0.1	0.0	0.5	0.0	0.0	
Grading					0.0	
Total Construction (FY04)	**0.1**	**0.03**	**0.5**	**0.00**	**0.04**	
FY05 Construction (Infrastructure)	0.1	0.0	0.3	0.0	0.0	
Grading					10.6	
Paving (ALZ)	**11.4**	**3.0**	**13.2**	**0.4**	**0.9**	***<--- Used On Table 4-31***
Total Construction (FY05)	**11.4**	**3.0**	**13.2**	**0.4**	**11.5**	***<--- Used On Table 4-51***

Table 4-15,-21,-31,-51

FY06 Construction (Infrastructure)	0.3	0.1	1.2	0.0	0.1
Grading					0.0
Total Construction (FY06)	**0.3**	**0.1**	**1.2**	**0.0**	**0.1**
FY07Construction (Infrastructure)	9.0	2.8	41.5	0.0	2.9
Grading					0.6
Paving (Parking)	1.8	2.7	9.4	0.1	0.8
Total Construction (FY07)	**10.8**	**5.5**	**50.9**	**0.1**	**4.3**
FY10 Construction (Infrastructure)	9.7	3.0	44.6	0.0	3.2
Grading					0.1
Total Construction (FY10)	**9.7**	**3.0**	**44.6**	**0.00**	**3.3**

Source	**Emissions (tons/year)**				
	CO	**VOC**	**NOx**	**SOx**	**PM**
Commuting POV	40.5	6.0	4.0	0.01	0.2
Total Commuting POV	**40.5**	**6.0**	**4.0**	**0.01**	**0.2**

Table 4-16

Proposed Action

MTR	TOTAL Increase in Emissions (Tons/yr) CO	VOC	NOx	SOx	PM
SR-205	0.5	0.0	9.4	0.5	0.6
SR-206	0.6	0.0	10.6	0.5	0.7
SR-208	0.7	0.0	12.4	0.6	0.8
SR-216	0.6	0.0	6.0	0.3	0.4
SR-217	3.2	0.2	229.5	11.4	15.5
VR-144	0.6	0.0	15.8	0.8	1.1
VR-144 ext	0.0	0.0	0.0	0.0	0.0
VR-184	2.0	0.1	141.5	7.0	9.5
VR-190	4.9	0.3	361.7	17.9	24.4
VR-191	1.2	0.1	47.8	2.4	3.2
VR-198	1.0	0.0	21.0	1.1	1.4
VR-199	1.0	0.0	21.0	1.1	1.4
IR-103	0.6	0.0	34.2	1.7	2.3
IR-154	0.5	0.0	11.8	0.6	0.8
IR-155	0.4	0.0	0.1	0.0	0.0
	17.7	**1.0**	**922.9**	**45.9**	**62.2**

Table 4-17

	Increase Emissions (tpy)				
	CO	VOC	NOx	SOx	PM
Peak	-100.2	-6.5	-484.9	-47.3	-59.3
End	-160.3	-27.5	-626.0	-55.5	-66.1

Table 4-17 support

Altus

PEAK STATE

Totals

Aircraft Emissions - TGOs (tons/year)

Aerodrome	CP/yr	CO	VOC	NOx	SOx	PM
C-5	1145	2.8	1.4	73.5	4.8	3.2
C-17	28554	32.6	9.0	827.5	65.6	155.8
KC-135	2971	10.1	0.1	28.1	4.5	3.3
TOTAL	**32670**	**45.5**	**10.5**	**929.1**	**74.9**	**162.3**

Difference

Aircraft Emissions - TGOs (tons/year)

CP/yr	CO	VOC	NOx	SOx	PM
-3630	-8.80617	-4.3	-233.0	-15.2	-10.1
-5605	-6.39518	-1.8	-162.4	-12.9	-30.6
-11957	-40.669	-0.4	-113.0	-18.2	-13.4
-21192	**-55.8704**	**-6.5**	**-508.5**	**-46.3**	**-54.1**

Aircraft Emissions - LTOs (tons/year)

Aerodrome	LTO/yr	CO	VOC	NOx	SOx	PM
C-5	1432	67.4	19.8	95.6	7.9	7.0
C-17	7164	108.2	11.3	224.2	23.6	83.3
KC-135	3024	158.8	5.1	50.1	13.9	53.0
TOTAL	**11620**	**334.4**	**36.2**	**369.9**	**45.3**	**143.3**

Difference

Aircraft Emissions - LTOs (tons/year)

LTO/yr	CO	VOC	NOx	SOx	PM
-12	-0.5633	-0.2	-0.8	-0.1	-0.1
1439	21.7252	2.3	45.0	4.7	16.7
-1247	-65.5045	-2.1	-20.7	-5.7	-21.9
179	**-44.3426**	**0.0**	**23.6**	**-1.1**	**-5.2**
SUM	**-100.2**	**-6.5**	**-484.9**	**-47.3**	**-59.3**

END STATE

Totals

Aircraft Emissions - TGOs (tons/year)

Aerodrome	CP/yr	CO	VOC	NOx	SOx	PM
C-5	0	0.0	0.0	0.0	0.0	0.0
C-17	28554	32.6	9.0	827.5	65.6	155.8
KC-135	5940	20.2	0.2	56.1	9.0	6.7
TOTAL	**34494**	**52.8**	**9.2**	**883.7**	**74.6**	**162.4**

Difference

Aircraft Emissions - TGOs (tons/year)

CP/yr	CO	VOC	NOx	SOx	PM
-4775	-11.5836	-5.7	-306.5	-20.0	-13.3
-5605	-6.39518	-1.8	-162.4	-12.9	-30.6
1669	-30.571	-0.3	-85.0	-13.7	-10.1
-8711	**-48.5498**	**-7.7**	**-553.9**	**-46.6**	**-53.9**

Aircraft Emissions - LTOs (tons/year)

Aerodrome	LTO/yr	CO	VOC	NOx	SOx	PM
C-5	0	0.0	0.0	0.0	0.0	0.0
C-17	7164	108.2	11.3	224.2	23.6	83.3
KC-135	3024	158.8	5.1	50.1	13.9	53.0
TOTAL	**10188**	**267.0**	**16.4**	**274.3**	**37.5**	**136.2**

Difference

Aircraft Emissions - LTOs (tons/year)

LTO/yr	CO	VOC	NOx	SOx	PM
-1444	-68.0081	-19.9	-96.4	-7.9	-7.1
1439	21.7252	2.3	45.0	4.7	16.7
-1247	-65.5045	-2.1	-20.7	-5.7	-21.9
-1253	**-111.787**	**-19.8**	**-72.1**	**-8.9**	**-12.2**
SUM	**-160.3**	**-27.5**	**-626.0**	**-55.5**	**-66.1**

All commuting emission changes are in AQCR 189.

Table 4-18 Change in Commuting Vehicle Emissions at Altus AFB, Proposed Action

Emission Source	Change in Annual Emissions (Tons/Year)				
	CO	VOC	NOx	SOx	PM
Commuting POV	39.7	5.9	3.9	0.1	0.2

Used in Table 4-19

Change in Commuting Vehicle Emissions at Altus AFB, Alternative Action

Emission Source	Change in Annual Emissions (Tons/Year)				
	CO	VOC	NOx	SOx	PM
Commuting POV	40.5	6	4	0.1	0.2

Used in Table 4-22

Table 4-19

PEAK STATE

	AQCR	189	Increase Emissions (tpy)		
	CO	**VOC**	**NOx**	**SOx**	**PM**
Total Aircraft Emissions	-20.6	4.6	530.0	26.3	84.7
Commuting Emissions	39.7	5.9	3.9	0.1	0.2
Total Emissions	**19.1**	**10.5**	**533.9**	**26.4**	**84.9**

END STATE

	AQCR	189	Increase Emissions (tpy)		
	CO	**VOC**	**NOx**	**SOx**	**PM**
Total Aircraft Emissions	-98.3	-20.6	145.3	-0.2	65.3
Commuting Emissions	39.7	5.9	3.9	0.1	0.2
Total Emissions	**-58.6**	**-14.7**	**149.2**	**-0.1**	**65.5**

Table 4-20

PEAK STATE

	Increase Emissions (tpy)				
	CO	**VOC**	**NOx**	**SOx**	**PM**
AQCR 187	0.2	0.0	4.4	0.2	0.3
AQCR 210	3.8	0.2	227.1	11.3	15.3

END STATE

	Increase Emissions (tpy)				
	CO	**VOC**	**NOx**	**SOx**	**PM**
AQCR 187	0.2	0.0	4.4	0.2	0.3
AQCR 210	3.8	0.2	227.1	11.3	15.3

Total Emiss Change, Ops

PEAK STATE	**TOTAL**					**AQCR**	187			
	Increase Emissions (tons/yr)					**Increase Emissions (tons/yr)**				
	CO	**VOC**	**NOx**	**SOx**	**PM**	**CO**	**VOC**	**NOx**	**SOx**	**PM**
Airfields										
Altus AFB	-100.2	-6.5	-484.9	-47.3	-59.3					
ALZ at Sooner	71.5	10.0	500.2	42.7	115.5			***Used in Table 4-30 --->***		
ALZ at CS	7.8	1.4	92.0	7.5	19.0					
CSIA	-6.6	-0.7	48.8	4.9	-15.8					
Amarillo IA	-237.2	-23.3	3.2	-10.5	-48.2					
Lubbock IA	-43.3	-1.7	-23.8	-4.8	-16.2					
Subtotal Airfields	**-308.1**	**-20.8**	**135.4**	**-7.6**	**-4.9**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Subtotal CSIA	1.2	0.7	140.8	12.4	3.2	***<--- Used in Table 4-50***				
MTRs										
SR-205	0.5	0.0	9.4	0.5	0.6	0.0	0.0	0.0	0.0	0.0
SR-206	0.6	0.0	10.6	0.5	0.7	0.0	0.0	0.0	0.0	0.0
SR-208	0.7	0.0	12.4	0.6	0.8	0.0	0.0	0.0	0.0	0.0
SR-216	0.6	0.0	6.0	0.3	0.4	0.0	0.0	0.0	0.0	0.0
SR-217	3.2	0.2	229.5	11.4	15.5	0.0	0.0	0.0	0.0	0.0
VR-144	0.6	0.0	15.8	0.8	1.1	0.0	0.0	0.0	0.0	0.0
VR-144 ext	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
VR-184	2.0	0.1	141.5	7.0	9.5	0.0	0.0	0.0	0.0	0.0
VR-190	4.9	0.3	361.7	17.9	24.4	0.0	0.0	0.0	0.0	0.0
VR-191	1.2	0.1	47.8	2.4	3.2	0.0	0.0	0.0	0.0	0.0
VR-198	1.0	0.0	21.0	1.1	1.4	0.1	0.0	2.2	0.1	0.1
VR-199	1.0	0.0	21.0	1.1	1.4	0.1	0.0	2.2	0.1	0.1
IR-103	0.6	0.0	34.2	1.7	2.3	0.0	0.0	0.0	0.0	0.0
IR-154	0.5	0.0	11.8	0.6	0.8	0.0	0.0	0.0	0.0	0.0
IR-155	0.4	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal MTRs	**17.7**	**1.0**	**922.9**	**45.9**	**62.2**	**0.2**	**0.0**	**4.4**	**0.2**	**0.3**

	TOTAL	**Increase Emissions (tons/yr)**				**AQCR**	**187**	**Increase Emissions (tpy)**		
	CO	**VOC**	**NOx**	**SOx**	**PM**	**CO**	**VOC**	**NOx**	**SOx**	**PM**
Total Aircraft Emissic	**-290.4**	**-19.8**	**1058.4**	**38.2**	**57.3**	**0.2**	**0.0**	**4.4**	**0.2**	**0.3**
Commuting Emissior	**39.7**	**5.9**	**3.9**	**0.1**	**0.2**					
Total Emissions	**-250.7**	**-13.9**	**1062.3**	**38.3**	**57.5**	**0.2**	**0.0**	**4.4**	**0.2**	**0.3**

Used in Table 4-20

END STATE	**TOTAL**					**AQCR 187**				
	Increase Emissions (tons/yr)					**Increase Emissions (tons/yr)**				
	CO	**VOC**	**NOx**	**SOx**	**PM**	**CO**	**VOC**	**NOx**	**SOx**	**PM**
Airfields										
Altus AFB	-160.3	-27.5	-626.0	-55.5	-66.1					
ALZ at Sooner	71.5	10.0	500.2	42.7	115.5					
ALZ at CS	7.8	1.4	92.0	7.5	19.0					
CSIA	-24.1	-4.9	-194.9	-13.5	-28.3					
Amarillo IA	-232.6	-26.0	-116.0	-15.6	-51.3					
Lubbock IA	-43.3	-1.7	-23.8	-4.8	-16.2					
Subtotal Airfields	**-381.2**	**-48.7**	**-368.4**	**-39.3**	**-27.4**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Subtotal CSIA	-16.3	-3.5	-102.9	-6.0	-9.3	***<--- Used in Table 4-50***				
MTRs										
SR-205	0.5	0.0	9.4	0.5	0.6	0.0	0.0	0.0	0.0	0.0
SR-206	0.6	0.0	10.6	0.5	0.7	0.0	0.0	0.0	0.0	0.0
SR-208	0.7	0.0	12.4	0.6	0.8	0.0	0.0	0.0	0.0	0.0
SR-216	0.6	0.0	6.0	0.3	0.4	0.0	0.0	0.0	0.0	0.0
SR-217	3.2	0.2	229.5	11.4	15.5	0.0	0.0	0.0	0.0	0.0
VR-144	0.6	0.0	15.8	0.8	1.1	0.0	0.0	0.0	0.0	0.0
VR-144 ext	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
VR-184	2.0	0.1	141.5	7.0	9.5	0.0	0.0	0.0	0.0	0.0
VR-190	4.9	0.3	361.7	17.9	24.4	0.0	0.0	0.0	0.0	0.0
VR-191	1.2	0.1	47.8	2.4	3.2	0.0	0.0	0.0	0.0	0.0
VR-198	1.0	0.0	21.0	1.1	1.4	0.1	0.0	2.2	0.1	0.1
VR-199	1.0	0.0	21.0	1.1	1.4	0.1	0.0	2.2	0.1	0.1
IR-103	0.6	0.0	34.2	1.7	2.3	0.0	0.0	0.0	0.0	0.0
IR-154	0.5	0.0	11.8	0.6	0.8	0.0	0.0	0.0	0.0	0.0
IR-155	0.4	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal MTRs	**17.7**	**1.0**	**922.9**	**45.9**	**62.2**	**0.2**	**0.0**	**4.4**	**0.2**	**0.3**

	TOTAL Increase Emissions (tons/yr)					**AQCR 187 Increase Emissions (tpy)**				
	CO	**VOC**	**NOx**	**SOx**	**PM**	**CO**	**VOC**	**NOx**	**SOx**	**PM**
Total Aircraft Emissio	**-363.5**	**-47.7**	**554.5**	**6.6**	**34.8**	**0.2**	**0.0**	**4.4**	**0.2**	**0.3**
Commuting Emission	**39.7**	**5.9**	**3.9**	**0.1**	**0.2**					
Total Emissions	**-323.8**	**-41.8**	**558.4**	**6.7**	**35.0**	**0.2**	**0.0**	**4.4**	**0.2**	**0.3**

PEAK STATE	AQCR 189					AQCR 210				
	Increase Emissions (tons/yr)					Increase Emissions (tons/yr)				
	CO	VOC	NOx	SOx	PM	CO	VOC	NOx	SOx	PM
Airfields										
Altus AFB	-100.2	-6.5	-484.9	-47.3	-59.3					
ALZ at Sooner	71.5	10.0	500.2	42.7	115.5					
ALZ at CS	7.8	1.4	92.0	7.5	19.0					
CSIA	-6.6	-0.7	48.8	4.9	-15.8					
Amarillo IA										
Lubbock IA										
Subtotal Airfields	**-27.6**	**4.2**	**156.0**	**7.7**	**59.5**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Subtotal CSIA										
MTRs										
SR-205	0.5	0.0	8.6	0.4	0.6	0.0	0.0	0.2	0.0	0.0
SR-206	0.1	0.0	2.3	0.1	0.2	0.1	0.0	1.0	0.1	0.1
SR-208	0.3	0.0	5.7	0.3	0.4	0.1	0.0	1.0	0.0	0.1
SR-216	0.3	0.0	3.7	0.2	0.2	0.0	0.0	0.1	0.0	0.0
SR-217	2.3	0.2	165.1	8.2	11.1	0.1	0.0	7.7	0.4	0.5
VR-144	0.3	0.0	9.1	0.5	0.6	0.2	0.0	6.7	0.3	0.5
VR-144 ext	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
VR-184	1.2	0.1	81.5	4.0	5.5	0.9	0.1	59.9	3.0	4.0
VR-190	0.9	0.1	65.5	3.2	4.4	1.4	0.1	106.9	5.3	7.2
VR-191	0.2	0.0	8.7	0.4	0.6	0.4	0.0	14.1	0.7	1.0
VR-198	0.4	0.0	7.6	0.4	0.5	0.0	0.0	0.1	0.0	0.0
VR-199	0.4	0.0	7.6	0.4	0.5	0.0	0.0	0.1	0.0	0.0
IR-103	0.2	0.0	8.8	0.4	0.6	0.5	0.0	25.4	1.3	1.7
IR-154	0.0	0.0	0.0	0.0	0.0	0.2	0.0	3.8	0.2	0.3
IR-155	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal MTRs	**7.0**	**0.4**	**374.0**	**18.6**	**25.2**	**3.8**	**0.2**	**227.1**	**11.3**	**15.3**

	AQCR	189	Increase Emissions (tpy)			AQCR	210	Increase Emissions (tpy)		
	CO	VOC	NOx	SOx	PM	CO	VOC	NOx	SOx	PM
Total Aircraft Emissic	**-20.6**	**4.6**	**530.0**	**26.3**	**84.7**	**3.8**	**0.2**	**227.1**	**11.3**	**15.3**
Commuting Emissior	**39.7**	**5.9**	**3.9**	**0.1**	**0.2**					
Total Emissions	**19.1**	**10.5**	**533.9**	**26.4**	**84.9**	**3.8**	**0.2**	**227.1**	**11.3**	**15.3**
	Used in Table 4-19					*Used in Table 4-20*				

END STATE	**AQCR 189**					**AQCR 210**				
	Increase Emissions (tons/yr)					**Increase Emissions (tons/yr)**				
	CO	**VOC**	**NOx**	**SOx**	**PM**	**CO**	**VOC**	**NOx**	**SOx**	**PM**
Airfields										
Altus AFB	-160.3	-27.5	-626.0	-55.5	-66.1					
ALZ at Sooner	71.5	10.0	500.2	42.7	115.5					
ALZ at CS	7.8	1.4	92.0	7.5	19.0					
CSIA	-24.1	-4.9	-194.9	-13.5	-28.3					
Amarillo IA										
Lubbock IA										
Subtotal Airfields	**-105.2**	**-21.0**	**-228.7**	**-18.8**	**40.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Subtotal CSIA										
MTRs										
SR-205	0.5	0.0	8.6	0.4	0.6	0.0	0.0	0.2	0.0	0.0
SR-206	0.1	0.0	2.3	0.1	0.2	0.1	0.0	1.0	0.1	0.1
SR-208	0.3	0.0	5.7	0.3	0.4	0.1	0.0	1.0	0.0	0.1
SR-216	0.3	0.0	3.7	0.2	0.2	0.0	0.0	0.1	0.0	0.0
SR-217	2.3	0.2	165.1	8.2	11.1	0.1	0.0	7.7	0.4	0.5
VR-144	0.3	0.0	9.1	0.5	0.6	0.2	0.0	6.7	0.3	0.5
VR-144 ext	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
VR-184	1.2	0.1	81.5	4.0	5.5	0.9	0.1	59.9	3.0	4.0
VR-190	0.9	0.1	65.5	3.2	4.4	1.4	0.1	106.9	5.3	7.2
VR-191	0.2	0.0	8.7	0.4	0.6	0.4	0.0	14.1	0.7	1.0
VR-198	0.4	0.0	7.6	0.4	0.5	0.0	0.0	0.1	0.0	0.0
VR-199	0.4	0.0	7.6	0.4	0.5	0.0	0.0	0.1	0.0	0.0
IR-103	0.2	0.0	8.8	0.4	0.6	0.5	0.0	25.4	1.3	1.7
IR-154	0.0	0.0	0.0	0.0	0.0	0.2	0.0	3.8	0.2	0.3
IR-155	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal MTRs	**7.0**	**0.4**	**374.0**	**18.6**	**25.2**	**3.8**	**0.2**	**227.1**	**11.3**	**15.3**

	AQCR 189 Increase Emissions (tpy)					**AQCR 210 Increase Emissions (tpy)**				
	CO	**VOC**	**NOx**	**SOx**	**PM**	**CO**	**VOC**	**NOx**	**SOx**	**PM**
Total Aircraft Emissio	**-98.3**	**-20.6**	**145.3**	**-0.2**	**65.3**	**3.8**	**0.2**	**227.1**	**11.3**	**15.3**
Commuting Emission	**39.7**	**5.9**	**3.9**	**0.1**	**0.2**					
Total Emissions	**-58.6**	**-14.7**	**149.2**	**-0.1**	**65.5**	**3.8**	**0.2**	**227.1**	**11.3**	**15.3**

Total Emiss Change, Ops

PEAK STATE	**AQCR** 211				
	Increase Emissions (tons/yr)				
	CO	**VOC**	**NOx**	**SOx**	**PM**
Airfields					
Altus AFB					
ALZ at Sooner					
ALZ at CS					
CSIA					
Amarillo IA	-237.2	-23.3	3.2	-10.5	-48.2
Lubbock IA	-43.3	-1.7	-23.8	-4.8	-16.2
Subtotal Airfields	**-280.5**	**-25.1**	**-20.6**	**-15.3**	**-64.4**
Subtotal CSIA					
MTRs					
SR-205	0.0	0.0	0.6	0.0	0.0
SR-206	0.4	0.0	7.3	0.4	0.5
SR-208	0.3	0.0	5.8	0.3	0.4
SR-216	0.2	0.0	2.3	0.1	0.2
SR-217	0.8	0.1	56.7	2.8	3.8
VR-144	0.0	0.0	0.0	0.0	0.0
VR-144 ext	0.0	0.0	0.0	0.0	0.0
VR-184	0.0	0.0	0.0	0.0	0.0
VR-190	2.6	0.2	189.4	9.4	12.8
VR-191	0.6	0.0	25.0	1.2	1.7
VR-198	0.5	0.0	11.1	0.6	0.7
VR-199	0.5	0.0	11.1	0.6	0.7
IR-103	0.0	0.0	0.0	0.0	0.0
IR-154	0.4	0.0	8.0	0.4	0.5
IR-155	0.4	0.0	0.1	0.0	0.0
Subtotal MTRs	**6.7**	**0.4**	**317.5**	**15.8**	**21.4**

	AQCR	**211**	**Increase Emissions (tpy)**		
	CO	**VOC**	**NOx**	**SOx**	**PM**
Total Aircraft Emissio	**-273.8**	**-24.7**	**296.9**	**0.4**	**-43.0**
Commuting Emission					
Total Emissions	**-273.8**	**-24.7**	**296.9**	**0.4**	**-43.0**

END STATE	AQCR 211				
	Increase Emissions (tons/yr)				
	CO	VOC	NOx	SOx	PM
Airfields					
Altus AFB					
ALZ at Sooner					
ALZ at CS					
CSIA					
Amarillo IA	-232.6	-26.0	-116.0	-15.6	-51.3
Lubbock IA	-43.3	-1.7	-23.8	-4.8	-16.2
Subtotal Airfields	**-276.0**	**-27.7**	**-139.7**	**-20.4**	**-67.5**
Subtotal CSIA					
MTRs					
SR-205	0.0	0.0	0.6	0.0	0.0
SR-206	0.4	0.0	7.3	0.4	0.5
SR-208	0.3	0.0	5.8	0.3	0.4
SR-216	0.2	0.0	2.3	0.1	0.2
SR-217	0.8	0.1	56.7	2.8	3.8
VR-144	0.0	0.0	0.0	0.0	0.0
VR-144 ext	0.0	0.0	0.0	0.0	0.0
VR-184	0.0	0.0	0.0	0.0	0.0
VR-190	2.6	0.2	189.4	9.4	12.8
VR-191	0.6	0.0	25.0	1.2	1.7
VR-198	0.5	0.0	11.1	0.6	0.7
VR-199	0.5	0.0	11.1	0.6	0.7
IR-103	0.0	0.0	0.0	0.0	0.0
IR-154	0.4	0.0	8.0	0.4	0.5
IR-155	0.4	0.0	0.1	0.0	0.0
Subtotal MTRs	**6.7**	**0.4**	**317.5**	**15.8**	**21.4**

	AQCR	211	Increase Emissions (tpy)		
	CO	VOC	NOx	SOx	PM
Total Aircraft Emissio	**-269.3**	**-27.3**	**177.7**	**-4.7**	**-46.1**
Commuting Emission					
Total Emissions	**-269.3**	**-27.3**	**177.7**	**-4.7**	**-46.1**

Table 4-22

PEAK STATE

	AQCR	189	Increase Emissions (tpy)		
	CO	VOC	NOx	SOx	PM
Total Aircraft Emissions	-80.6	-15.7	396.1	18.3	0.2
Commuting Emissions	40.5	6.0	4.0	0.1	0.2
Total Emissions	**-40.1**	**-9.7**	**400.1**	**18.4**	**0.4**

END STATE

	AQCR	189	Increase Emissions (tpy)		
	CO	VOC	NOx	SOx	PM
Total Aircraft Emissions	-100.3	-29.2	-63.9	-11.0	-15.2
Commuting Emissions	40.5	6.0	4.0	0.1	0.2
Total Emissions	**-59.8**	**-23.2**	**-59.9**	**-10.9**	**-15.0**

Table 4-23

PEAK STATE

	Increase Emissions (tpy)				
	CO	**VOC**	**NOx**	**SOx**	**PM**
AQCR 187	0.2	0.0	4.4	0.2	0.3
AQCR 210	5.0	0.3	315.9	15.7	21.3

END STATE

	Increase Emissions (tpy)				
	CO	**VOC**	**NOx**	**SOx**	**PM**
AQCR 187	0.2	0.0	4.4	0.2	0.3
AQCR 210	5.0	0.3	315.9	15.7	21.3

Total Emiss Change, Alt

PEAK STATE	TOTAL					AQCR 187				
	Increase Emissions (tons/yr)					**Increase Emissions (tons/yr)**				
	CO	**VOC**	**NOx**	**SOx**	**PM**	**CO**	**VOC**	**NOx**	**SOx**	**PM**
Airfields										
Altus AFB	-153.1	-26.0	-728.4	-60.0	-146.5					
ALZ at Sooner	0.0	0.0	0.0	0.0	0.0					
ALZ at CS	70.5	10.6	582.1	48.9	129.2					
CSIA	-6.6	-0.7	48.8	4.9	-15.8					
Amarillo IA	-247.3	-23.4	-24.9	-15.0	-51.5					
Lubbock IA	-43.3	-1.7	-23.8	-4.8	-16.2					
Subtotal Airfields	**-379.7**	**-41.3**	**-146.2**	**-26.0**	**-100.8**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
MTRs										
SR-205	0.5	0.0	9.4	0.5	0.6	0.0	0.0	0.0	0.0	0.0
SR-206	0.6	0.0	10.6	0.5	0.7	0.0	0.0	0.0	0.0	0.0
SR-208	0.7	0.0	12.4	0.6	0.8	0.0	0.0	0.0	0.0	0.0
SR-216	0.6	0.0	6.0	0.3	0.4	0.0	0.0	0.0	0.0	0.0
SR-217	3.2	0.2	229.5	11.4	15.5	0.0	0.0	0.0	0.0	0.0
VR-144	0.6	0.0	15.8	0.8	1.1	0.0	0.0	0.0	0.0	0.0
VR-144 ext	2.8	0.2	208.5	10.3	14.0	0.0	0.0	0.0	0.0	0.0
VR-184	2.0	0.1	141.5	7.0	9.5	0.0	0.0	0.0	0.0	0.0
VR-190	4.9	0.3	361.7	17.9	24.4	0.0	0.0	0.0	0.0	0.0
VR-191	1.2	0.1	47.8	2.4	3.2	0.0	0.0	0.0	0.0	0.0
VR-198	1.0	0.0	21.0	1.1	1.4	0.1	0.0	2.2	0.1	0.1
VR-199	1.0	0.0	21.0	1.1	1.4	0.1	0.0	2.2	0.1	0.1
IR-103	0.6	0.0	34.2	1.7	2.3	0.0	0.0	0.0	0.0	0.0
IR-154	0.5	0.0	11.8	0.6	0.8	0.0	0.0	0.0	0.0	0.0
IR-155	0.4	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal MTRs	**20.5**	**1.2**	**1131.4**	**56.2**	**76.2**	**0.2**	**0.0**	**4.4**	**0.2**	**0.3**

	TOTAL Increase Emissions (tons/yr)					**AQCR 187 Increase Emissions (tpy)**				
	CO	**VOC**	**NOx**	**SOx**	**PM**	**CO**	**VOC**	**NOx**	**SOx**	**PM**
Total Aircraft Emissio	**-359.3**	**-40.1**	**985.3**	**30.1**	**-24.5**	**0.2**	**0.0**	**4.4**	**0.2**	**0.3**
Commuting Emissior	**40.5**	**6.0**	**4.0**	**0.1**	**0.2**					
Total Emissions	**-318.8**	**-34.1**	**989.3**	**30.2**	**-24.3**	**0.2**	**0.0**	**4.4**	**0.2**	**0.3**

Used in Table 4-23

Total Emiss Change, Alt

END STATE	**TOTAL**					**AQCR 187**				
	Increase Emissions (tons/yr)					**Increase Emissions (tons/yr)**				
	CO	**VOC**	**NOx**	**SOx**	**PM**	**CO**	**VOC**	**NOx**	**SOx**	**PM**
Airfields										
Altus AFB	-171.6	-36.0	-950.0	-72.3	-154.8					
ALZ at Sooner	0.0	0.0	0.0	0.0	0.0					
ALZ at CS	70.5	10.6	582.1	48.9	129.2					
CSIA	-7.7	-4.3	-189.7	-12.1	-22.8					
Amarillo IA	-245.9	-27.0	-224.9	-26.5	-69.8					
Lubbock IA	-43.3	-1.7	-23.8	-4.8	-16.2					
Subtotal Airfields	**-398.1**	**-58.4**	**-806.2**	**-66.8**	**-134.5**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
MTRs										
SR-205	0.5	0.0	9.4	0.5	0.6	0.0	0.0	0.0	0.0	0.0
SR-206	0.6	0.0	10.6	0.5	0.7	0.0	0.0	0.0	0.0	0.0
SR-208	0.7	0.0	12.4	0.6	0.8	0.0	0.0	0.0	0.0	0.0
SR-216	0.6	0.0	6.0	0.3	0.4	0.0	0.0	0.0	0.0	0.0
SR-217	3.2	0.2	229.5	11.4	15.5	0.0	0.0	0.0	0.0	0.0
VR-144	0.6	0.0	15.8	0.8	1.1	0.0	0.0	0.0	0.0	0.0
VR-144 ext	2.8	0.2	208.5	10.3	14.0	0.0	0.0	0.0	0.0	0.0
VR-184	2.0	0.1	141.5	7.0	9.5	0.0	0.0	0.0	0.0	0.0
VR-190	4.9	0.3	361.7	17.9	24.4	0.0	0.0	0.0	0.0	0.0
VR-191	1.2	0.1	47.8	2.4	3.2	0.0	0.0	0.0	0.0	0.0
VR-198	1.0	0.0	21.0	1.1	1.4	0.1	0.0	2.2	0.1	0.1
VR-199	1.0	0.0	21.0	1.1	1.4	0.1	0.0	2.2	0.1	0.1
IR-103	0.6	0.0	34.2	1.7	2.3	0.0	0.0	0.0	0.0	0.0
IR-154	0.5	0.0	11.8	0.6	0.8	0.0	0.0	0.0	0.0	0.0
IR-155	0.4	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal MTRs	**20.5**	**1.2**	**1131.4**	**56.2**	**76.2**	**0.2**	**0.0**	**4.4**	**0.2**	**0.3**

	TOTAL Increase Emissions (tons/yr)					**AQCR 187 Increase Emissions (tpy)**				
	CO	**VOC**	**NOx**	**SOx**	**PM**	**CO**	**VOC**	**NOx**	**SOx**	**PM**
Total Aircraft Emissio	**-377.6**	**-57.2**	**325.2**	**-10.6**	**-58.2**	**0.2**	**0.0**	**4.4**	**0.2**	**0.3**
Commuting Emission	**40.5**	**6.0**	**4.0**	**0.1**	**0.2**					
Total Emissions	**-337.1**	**-51.2**	**329.2**	**-10.5**	**-58.0**	**0.2**	**0.0**	**4.4**	**0.2**	**0.3**

PEAK STATE

	AQCR 189					AQCR 210				
	Increase Emissions (tons/yr)					Increase Emissions (tons/yr)				
	CO	**VOC**	**NOx**	**SOx**	**PM**	**CO**	**VOC**	**NOx**	**SOx**	**PM**
Airfields										
Altus AFB	-153.1	-26.0	-728.4	-60.0	-146.5					
ALZ at Sooner	0.0	0.0	0.0	0.0	0.0					
ALZ at CS	70.5	10.6	582.1	48.9	129.2					
CSIA	-6.6	-0.7	48.8	4.9	-15.8					
Amarillo IA										
Lubbock IA										
Subtotal Airfields	**-89.1**	**-16.2**	**-97.5**	**-6.2**	**-33.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
MTRs										
SR-205	0.5	0.0	8.6	0.4	0.6	0.0	0.0	0.2	0.0	0.0
SR-206	0.1	0.0	2.3	0.1	0.2	0.1	0.0	1.0	0.1	0.1
SR-208	0.3	0.0	5.7	0.3	0.4	0.1	0.0	1.0	0.0	0.1
SR-216	0.3	0.0	3.7	0.2	0.2	0.0	0.0	0.1	0.0	0.0
SR-217	2.3	0.2	165.1	8.2	11.1	0.1	0.0	7.7	0.4	0.5
VR-144	0.3	0.0	9.1	0.5	0.6	0.2	0.0	6.7	0.3	0.5
VR-144 ext	1.6	0.1	119.7	5.9	8.1	1.2	0.1	88.8	4.4	6.0
VR-184	1.2	0.1	81.5	4.0	5.5	0.9	0.1	59.9	3.0	4.0
VR-190	0.9	0.1	65.5	3.2	4.4	1.4	0.1	106.9	5.3	7.2
VR-191	0.2	0.0	8.7	0.4	0.6	0.4	0.0	14.1	0.7	1.0
VR-198	0.4	0.0	7.6	0.4	0.5	0.0	0.0	0.1	0.0	0.0
VR-199	0.4	0.0	7.6	0.4	0.5	0.0	0.0	0.1	0.0	0.0
IR-103	0.2	0.0	8.8	0.4	0.6	0.5	0.0	25.4	1.3	1.7
IR-154	0.0	0.0	0.0	0.0	0.0	0.2	0.0	3.8	0.2	0.3
IR-155	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal MTRs	**8.6**	**0.5**	**493.7**	**24.5**	**33.3**	**5.0**	**0.3**	**315.9**	**15.7**	**21.3**

	AQCR	**189**	**Increase Emissions (tpy)**			**AQCR**	**210**	**Increase Emissions (tpy)**		
	CO	**VOC**	**NOx**	**SOx**	**PM**	**CO**	**VOC**	**NOx**	**SOx**	**PM**
Total Aircraft Emissio	**-80.6**	**-15.7**	**396.1**	**18.3**	**0.2**	**5.0**	**0.3**	**315.9**	**15.7**	**21.3**
Commuting Emission	**40.5**	**6.0**	**4.0**	**0.1**	**0.2**					
Total Emissions	**-40.1**	**-9.7**	**400.1**	**18.4**	**0.4**	**5.0**	**0.3**	**315.9**	**15.7**	**21.3**

Used in Table 4-22 *Used in Table 4-23*

Total Emiss Change, Alt

END STATE	**AQCR 189**					**AQCR 210**				
	Increase Emissions (tons/yr)					**Increase Emissions (tons/yr)**				
	CO	**VOC**	**NOx**	**SOx**	**PM**	**CO**	**VOC**	**NOx**	**SOx**	**PM**
Airfields										
Altus AFB	-171.6	-36.0	-950.0	-72.3	-154.8					
ALZ at Sooner	0.0	0.0	0.0	0.0	0.0					
ALZ at CS	70.5	10.6	582.1	48.9	129.2					
CSIA	-7.7	-4.3	-189.7	-12.1	-22.8					
Amarillo IA										
Lubbock IA										
Subtotal Airfields	**-108.8**	**-29.7**	**-557.6**	**-35.5**	**-48.5**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
MTRs										
SR-205	0.5	0.0	8.6	0.4	0.6	0.0	0.0	0.2	0.0	0.0
SR-206	0.1	0.0	2.3	0.1	0.2	0.1	0.0	1.0	0.1	0.1
SR-208	0.3	0.0	5.7	0.3	0.4	0.1	0.0	1.0	0.0	0.1
SR-216	0.3	0.0	3.7	0.2	0.2	0.0	0.0	0.1	0.0	0.0
SR-217	2.3	0.2	165.1	8.2	11.1	0.1	0.0	7.7	0.4	0.5
VR-144	0.3	0.0	9.1	0.5	0.6	0.2	0.0	6.7	0.3	0.5
VR-144 ext	1.6	0.1	119.7	5.9	8.1	1.2	0.1	88.8	4.4	6.0
VR-184	1.2	0.1	81.5	4.0	5.5	0.9	0.1	59.9	3.0	4.0
VR-190	0.9	0.1	65.5	3.2	4.4	1.4	0.1	106.9	5.3	7.2
VR-191	0.2	0.0	8.7	0.4	0.6	0.4	0.0	14.1	0.7	1.0
VR-198	0.4	0.0	7.6	0.4	0.5	0.0	0.0	0.1	0.0	0.0
VR-199	0.4	0.0	7.6	0.4	0.5	0.0	0.0	0.1	0.0	0.0
IR-103	0.2	0.0	8.8	0.4	0.6	0.5	0.0	25.4	1.3	1.7
IR-154	0.0	0.0	0.0	0.0	0.0	0.2	0.0	3.8	0.2	0.3
IR-155	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal MTRs	**8.6**	**0.5**	**493.7**	**24.5**	**33.3**	**5.0**	**0.3**	**315.9**	**15.7**	**21.3**

	AQCR 189 Increase Emissions (tpy)					**AQCR 210 Increase Emissions (tpy)**				
	CO	**VOC**	**NOx**	**SOx**	**PM**	**CO**	**VOC**	**NOx**	**SOx**	**PM**
Total Aircraft Emissio	**-100.3**	**-29.2**	**-63.9**	**-11.0**	**-15.2**	**5.0**	**0.3**	**315.9**	**15.7**	**21.3**
Commuting Emission	**40.5**	**6.0**	**4.0**	**0.1**	**0.2**					
Total Emissions	**-59.8**	**-23.2**	**-59.9**	**-10.9**	**-15.0**	**5.0**	**0.3**	**315.9**	**15.7**	**21.3**

PEAK STATE	AQCR 211				
	Increase Emissions (tons/yr)				
	CO	VOC	NOx	SOx	PM
Airfields					
Altus AFB					
ALZ at Sooner					
ALZ at CS					
CSIA					
Amarillo IA	-247.3	-23.4	-24.9	-15.0	-51.5
Lubbock IA	-43.3	-1.7	-23.8	-4.8	-16.2
Subtotal Airfields	**-290.6**	**-25.1**	**-48.7**	**-19.8**	**-67.7**
MTRs					
SR-205	0.0	0.0	0.6	0.0	0.0
SR-206	0.4	0.0	7.3	0.4	0.5
SR-208	0.3	0.0	5.8	0.3	0.4
SR-216	0.2	0.0	2.3	0.1	0.2
SR-217	0.8	0.1	56.7	2.8	3.8
VR-144	0.0	0.0	0.0	0.0	0.0
VR-144 ext	0.0	0.0	0.0	0.0	0.0
VR-184	0.0	0.0	0.0	0.0	0.0
VR-190	2.6	0.2	189.4	9.4	12.8
VR-191	0.6	0.0	25.0	1.2	1.7
VR-198	0.5	0.0	11.1	0.6	0.7
VR-199	0.5	0.0	11.1	0.6	0.7
IR-103	0.0	0.0	0.0	0.0	0.0
IR-154	0.4	0.0	8.0	0.4	0.5
IR-155	0.4	0.0	0.1	0.0	0.0
Subtotal MTRs	**6.7**	**0.4**	**317.5**	**15.8**	**21.4**

	AQCR	**211**	**Increase Emissions (tpy)**		
	CO	**VOC**	**NOx**	**SOx**	**PM**
Total Aircraft Emissic	**-283.9**	**-24.8**	**268.8**	**-4.1**	**-46.3**
Commuting Emissior					
Total Emissions	**-283.9**	**-24.8**	**268.8**	**-4.1**	**-46.3**

Total Emiss Change, Alt

END STATE	AQCR 211				
	Increase Emissions (tons/yr)				
	CO	VOC	NOx	SOx	PM
Airfields					
Altus AFB					
ALZ at Sooner					
ALZ at CS					
CSIA					
Amarillo IA	-245.9	-27.0	-224.9	-26.5	-69.8
Lubbock IA	-43.3	-1.7	-23.8	-4.8	-16.2
Subtotal Airfields	**-289.3**	**-28.7**	**-248.6**	**-31.4**	**-86.0**
MTRs					
SR-205	0.0	0.0	0.6	0.0	0.0
SR-206	0.4	0.0	7.3	0.4	0.5
SR-208	0.3	0.0	5.8	0.3	0.4
SR-216	0.2	0.0	2.3	0.1	0.2
SR-217	0.8	0.1	56.7	2.8	3.8
VR-144	0.0	0.0	0.0	0.0	0.0
VR-144 ext	0.0	0.0	0.0	0.0	0.0
VR-184	0.0	0.0	0.0	0.0	0.0
VR-190	2.6	0.2	189.4	9.4	12.8
VR-191	0.6	0.0	25.0	1.2	1.7
VR-198	0.5	0.0	11.1	0.6	0.7
VR-199	0.5	0.0	11.1	0.6	0.7
IR-103	0.0	0.0	0.0	0.0	0.0
IR-154	0.4	0.0	8.0	0.4	0.5
IR-155	0.4	0.0	0.1	0.0	0.0
Subtotal MTRs	**6.7**	**0.4**	**317.5**	**15.8**	**21.4**

	AQCR	211	Increase Emissions (tpy)		
	CO	**VOC**	**NOx**	**SOx**	**PM**
Total Aircraft Emissio	**-282.5**	**-28.3**	**68.8**	**-15.6**	**-64.6**
Commuting Emissior					
Total Emissions	**-282.5**	**-28.3**	**68.8**	**-15.6**	**-64.6**

Table 4-30

	Increase Emissions (tpy)				
	CO	**VOC**	**NOx**	**SOx**	**PM**
Sooner DZ	71.5	10.0	500.2	42.7	115.5

Table 4-50

PEAK STATE

	Increase Emissions (tpy)				
	CO	VOC	NOx	SOx	PM
CSIA	1.2	0.7	140.8	12.4	3.2

END STATE

	Increase Emissions (tpy)				
	CO	VOC	NOx	SOx	PM
CSIA	-16.3	-3.5	-102.9	-6.0	-9.3

Table 4-64

PEAK STATE

	Increase Emissions (tpy)				
	CO	VOC	NOx	SOx	PM
Amarillo IA	-237.2	-23.3	3.2	-10.5	-48.2

END STATE

	Increase Emissions (tpy)				
	CO	VOC	NOx	SOx	PM
Amarillo IA	-232.6	-26.0	-116.0	-15.6	-51.3

Table 4-65

PEAK STATE

	Increase Emissions (tpy)				
	CO	**VOC**	**NOx**	**SOx**	**PM**
AQCR 211	-273.8	-24.7	296.9	0.4	-43.0

END STATE

	Increase Emissions (tpy)				
	CO	**VOC**	**NOx**	**SOx**	**PM**
AQCR 211	-269.3	-27.3	177.7	-4.7	-46.1

Table 4-66

PEAK STATE

	Increase Emissions (tpy)				
	CO	**VOC**	**NOx**	**SOx**	**PM**
AQCR 211	-283.9	-24.8	268.8	-4.1	-46.3

END STATE

	Increase Emissions (tpy)				
	CO	**VOC**	**NOx**	**SOx**	**PM**
AQCR 211	-282.5	-28.3	68.8	-15.6	-64.6

APPENDIX D

SUMMARY OF COMMENTS

On June 6, 2004, the Altus AFB Environmental Flight published a Notice of Availability in the Altus Times, Lubbock Avalanche-Journal, Clinton Daily News, and Amarillo Globe-News announcing an opportunity to comment on this Environmental Assessment. Concurrently, copies of the EA were sent to appropriate government organizations. Comments received from persons and agencies during the public comment period that concluded July 6, 2004 are summarized in the following table and copies of the comments are provided in this appendix. The comment numbers in the table below are keyed to the comment numbers marked in the margins of the photocopies.

As per the privacy notice provided in the Draft Environmental Assessment, personal information provided during the public comment period is kept confidential. Only names of the individuals making comments and specific comments are disclosed in the following pages. Personal home addresses and phone numbers are not published in this document.

Responses to Comments Provided During Public Comment Period

Comment Number	Comment/Response
R-1	COMMENT: "Pepper et al. (2003) reported that the Environmental Protection Agency's (EPA) noise exposure limits for neighborhoods are 55 decibels (dB) during waking hours and 45 dB during sleeping hours. As shown in Tables 2 and 3 the level of noise exposure that will be experienced by humans in areas that are flown over by C-17 aircraft flying MTR will certainly be at or exceed the EPA noise exposure limits during sleeping hours and when flying some MTR will be near the EPA noise exposure during waking hours." RESPONSE: We are not familiar with the Pepper document cited. The basic standards adopted by the federal government are those recommended in the Environmental Protection Agency's document "Information On Levels Of Environmental Noise Requisite To Protect Public Health and Welfare With An Adequate Margin Of Safety" (March 1974). Table 1 in this document, "Summary Of Noise Levels Identified As Requisite To Protect Public Health And Welfare With An Adequate Margin Of Safety," identifies two recommended levels of noise. For outdoors in residential areas and farms and other outdoor areas where people spend widely varying amounts of time and other places in which quiet is a basis for use, the level is equal to, or less than L_{dn} 55 dB. For indoor residential areas, the level is equal to, or less than L_{dn} 45 dB.

Comment Number	Comment/Response
R-1 (Con't)	Two additional factors should also be noted. First, normal housing construction will attenuate outdoor sound levels by approximately 20 dB or more. Secondly, the levels recommended in the EPA document, as well as those described for specific land uses in other federal agency documents are not legal absolutes. They are recommendations, and are intended to provide guidance on land uses that are generally compatible with identified noise levels.
R-2	COMMENT: "Although it is difficult to assess, research suggests that aircraft noise may also have a negative effect on domestic livestock and wildlife (Pepper et al., 2003). Some of the negative effects that may be elicited by aircraft noise are interrupted feeding patterns, overall productivity, and decreased reproduction rates (Pepper et al., 2003)." RESPONSE: Although some research studies indicate negative effects on animals is possible, the studies are not conclusive. The Air Force experience is that overflights on MTRs normally do not have a direct effect on large domestic livestock. Furthermore, infrequent use of MTRs by C-17 aircrews would indicate minimal noise impacts.
R-3	COMMENT: "Humans have differing levels of tolerance for noise (Pepper et al., 2003) and therefore, the sound levels shown in Tables 2 and 3 may not be a valid guide for estimating human tolerance for the increased aircraft noise levels in the areas of MTR. Just the increase in the annoyance levels of citizens living in these areas may elicit a negative response. A person's reaction to each additional C-17 flyovers, regardless of sound level, may be additive to the point that a complaint is registered. RESPONSE: Although humans have differing levels of tolerance for noise, there is no relationship between the noise levels on the MTRs shown in the tables and tolerance of those levels. Furthermore, the trigger point for complaints is only speculative. Examining this proposal, the highest adjusted day-night average sound level on any MTR may increase as much as 16 decibels, the level would not exceed 52 decibels. Considering the facts that residences normally have noise insulation of at least 20 dB and pilots are instructed to avoid overflight of residences on the MTRs, noise impact would be minimal.

Comment Number	Comment/Response
R-4	COMMENT: "One issue that is not addressed in USAF (2004) is that MTR IR-154 and IR-155 (Figure 2 in Appendix) have north to south routes that have to be crossed by commercial and private aircraft approaching Lubbock IAP from the east. Increased utilization of these MTR could have a significant effect on commercial and private utilization of the intersecting airspace." All aircraft operating on Instrument Flight Rules (IFR) Military Training Routes (IR) routes such as IR-154 and IR-155 are on an IFR clearance and are in contact with air traffic control. Air traffic control provides separation between aircraft operating on IR routes and other aircraft on IFR clearances, as well as offering traffic advisories to aircrew in the vicinity of other traffic operating under visual flight rules. This aspect of IR routes, combined with the relative infrequency of their scheduled use (one per day), should alleviate the conflicts into the Lubbock International Airport.
R-5	COMMENT: "Additionally, increased utilization of Lubbock IAP for C-17 training purposes could also have an effect on the utilization of Lubbock IAP by commercial and private aircraft, given that Lubbock IAP is a public airport." "Additionally, increased utilization of this airspace and the Lubbock IAP by C-17 aircraft may have a negative effect on the intended purpose of Lubbock IAP, which is to accommodate commercial and private aircraft traffic for the convenience and economic benefit of the citizens of Lubbock." RESPONSE: Any time Air Force aircrews operate at civilian fields, especially at fields with incoming and outbound commercial traffic, there is the understanding that we do not intend to disrupt traffic flow. We maintain regular contact with the airfields we operate into and out of, including Lubbock and Amarillo IAPs. If air traffic is congested, we would be denied authorization to approach the airfield by the Federal Aviation Agency air traffic controller. Specifically at Lubbock IAP, although there would be a slight increase in C-17 operations, the total number of operations planned would be slightly less than current levels.

Comment Number	Comment/Response
R-6	COMMENT: “Increased utilization of the airspace between Lubbock, Lubbock County, Texas and AAFB by C-17 military aircraft may cause increased annoyances to both human and animal inhabitants of this areas as well as the area in and around Lubbock IAP.” RESPONSE: Analysis in the environmental assessment (Sections 4.3.1.1 and 4.3.2.1) clearly indicated an increase in flying on the MTRs but concluded noise impacts would be minimal and air quality would improve slightly.
R-7	COMMENT: “Although the Amarillo IAP has not been considered in this response, air traffic utilization and noise levels there will also be affected by increased utilization by C-17 aircraft from AAFB. However, in the list of “Persons and Agencies Consulted in USAF (2004O no person or agencies in the state of Texas, the cities of Lubbock and Amarillo, nor in counties that are over flown by MTR were consulted regarding the effects of increased C-17 training.” RESPONSE: Consultation/coordination with Texas agencies was inadvertently omitted from the Draft Environmental Assessment. Coordination with Amarillo and Lubbock International Airports did occur. In addition, the Draft Environmental Assessment was submitted to the Texas State Single Point of Contact for review. All persons and agencies contacted in consultation with this project have been incorporated into the Final Environmental Assessment.
R-8	COMMENT: “… since the Oklahoma Space Industry Development Authority (OSIDA) board has decided ***not*** to pursue vertical launches at Clinton-Sherman Airport, the need for a launch pad at this facility is no longer an issue. Suggest that the portion of the environmental assessment, which relates to to launch sites and engine test cells at Clinton-Sherman Industrial Airpark, be eliminated.” RESPONSE: Although the environmental assessment addresses vertical launches, this comment clearly indicates there has been a change in the proposal for Clinton-Sherman Industrial Airport such that any impacts due to vertical launches would not occur. However, to provide for the most conservative analysis, the portions of the environmental assessment related to vertical launches have been retained in the environmental assessment.

Comment Number	Comment/Response
R-9	COMMENT: “I have reviewed your Draft Environmental Assessment for C-17 Program Changes dated Jun 2004 and coordinates without comment.” RESPONSE: Noted.
R-10	COMMENT: “We are in agreement with your assessment that neither properties listed, nor eligible for the National Register of Historic Places will be affected by the proposed action….” RESPONSE: Noted.
R-11	COMMENT: “However, if the foreseeable action or “Alternative Action (construction of the Sooner Assault Landing Zone, Site 1 or 2) occur, the State Historic Preservation Office must be informed of the intended action so that we can assist you in either avoiding or mitigating potential National Register eligible historic archeological sites ….” RESPONSE: Noted.
R-12	COMMENT: “We have experienced problems with the noise from the drop zone, but the much increased noise level caused by the assault strip will make the problems unmanageable and unworkable for our operation.” RESPONSE: Noted.

Rcvd 6 July 04

Response to the Environmental Assessment and Finding of No Significant Impact
for C-17 Program Changes at Altus Air Force Base, Oklahoma

Colleen M. Kendall
[redacted]

2 July 2004

Response to the Environmental Assessment and Finding of No Significant Impact for C-17 Program Changes at Altus Air Force Base, Oklahoma

Colleen M. Kendall
[redacted]

This paper is a response to the invitation for public comment on the environmental assessment and finding of no significant impact for C-17 program changes at Altus Air Force Base, Oklahoma that was published in the June 6, 2004 edition of the Lubbock Avalanche-Journal (Figure 1 in Appendix).

As proposed in USAF (2004), the United States Air Force, namely Altus Air Force Base, Oklahoma (AAFB) will add up to eight C-17 aircraft to the current inventory of 10. The additional C-17 aircraft will bring the total number of C-17 aircraft based at AAFB to 18 by 2007. In addition to C-17 aircraft, C-5 and KC-135 aircraft are also currently in inventory at AAFB. However, the C-5 aircraft will eventually be transferred to another base, with complete transfer of all C-5 aircraft accomplished by 2008 (USAF, 2004).

With the increased number of C-17 aircraft in inventory at AAFB, usage of Military Training Routes (MTR) in the counties east of Lubbock, Lubbock County, Texas will also increase. As shown in Table 1, usage of some MTR will increase by as much as 2900%. Along with the increased usage of the MTR by the C-17 aircraft will come increased noise levels experience by humans, domestic livestock, and wildlife that inhabit areas below the MTR (Tables 2 and 3).

Table 1. C-17 Use of Military Training Routes, Proposed Action (USAF, 2004).

Description	Current	FY 05	% Increase
SR[1]-205	1 (0)	30 (7)	2900 (700)
SR-206	1 (0)	30 (7)	2900 (700)
SR-208	1 (0)	30 (7)	2900 (700)
SR-216	3 (1)	30 (7)	900 (600)
SR-217	55 (20)	83 (30)	51 (50)
VR[2]-144	3 (2)	30 (7)	900 (250)
VR-184	33 (20)	50 (30)	52 (50)
VR-190	55 (20)	83 (30)	51 (50)
VR-191	6 (2)	30 (7)	400 (250)
VR-198	1 (0)	30 (7)	2900 (700)
VR-199	1 (0)	30 (7)	2900 (700)
IR[3]-103	22 (0)	30 (7)	36 (700)
IR-154	2 (0)	30 (7)	1400 (700)
IR-155	4 (0)	30 (7)	650 (700)

Uses per month, number in parenthesis indicates night operations
[1]SR = Slow routes
[2]VR = Visual Flight Rules
[3]IR = Instrument Flight Rules

Table 2. Noise Levels in Military Training Airspace, Proposed Action (USAF, 2004).

Route	Segment	Sound Level in L_{dnmr}[4] Baseline	Proposed	Change
SR[1]-205	A-B	30	46	+16
	B-E	28	44	+16
SR-206	A-B	30	46	+16
	B-E	28	44	+16
SR-208	A-B	28	44	+16
	C-F			
	B-C	31	47	+16
SR-216	All	38	47	+9
SR-217	A-C	48	50	+2
	D-G			
	C-D	50	52	+2
VR[2]-144	A-C	38	44	+6
	E-F			
	C-E	35	41	+6
	Extended	N/A	47	+47
VR-184	A-B	48	50	+2
	D-F			
	B-D	45	47	+2
VR-190	All	48	50	+2
VR-191	All	39	44	+5
VR-198	A-B	28	44	+16
	C-K			
	B-C	25	41	+16
VR-199	A-I	28	44	+16
	J-K			
	I-J	25	41	+16
IR[3]-103	A-D	32	38	+6
	D-F	37	43	+6
IR-154	All	29	43	+14
IR-155	A-B	31	43	+12
	B-K	29	41	+12
	K-N	31	43	+12

N/A – Data not available. Indicated segment does not currently exist.
[1]SR = Slow routes
[2]VR = Visual Flight Rules
[3]IR = Instrument Flight Rules
[4]L_{dnmr} = Onset rate-Adjusted Monthly Day-Night Average Sound Level

Table 3. Cumulative Noise Levels Along Military Training Routes (USAF, 2004).

MTR Interaction	Noise Levels in L_{dnmr}[4]		
	Baseline	Proposed	Change
IR[1]-154 + IR-155 (B-C)	32	45	13
IR-154 + IR-155 (I-K)	32	45	13
IR-154 + IR-155 (K-N)	33	46	13
VR[2]-198 (B-C) + VR-199 (I-J)	28	44	16
VR-198 (A-B / C-K) + VR-199 (A-I / J-K)	31	47	16
VR-190 + VR-191	49	51	2
VR-190 + VR-191 +VR-198 (D-E) + VR-199 (G-H)	49	53	4
SR[3]-216 + VR-190 + VR-191 + VR-198 (D-E) + VR-199 (G-H)	49	54	5
SR-216 + VR-190 + VR-191	49	52	3
SR-206 (A-B) + VR-190 + VR-191	49	52	3
SR-205 (B-E) + VR-190 + VR-191	49	52	3
SR-205 (B-E) + VR-144 (A-C / E-F) + VR-184 (A-B / D-F)	48	52	4
SR-206 (B-E) + SR-208 (A-B) + VR-190 + VR-191	49	53	4
SR-217 (D-F) + VR-190 + VR-191	52	54	2
SR-205 (B-E) + SR-216 + SR-217 (A-C) + VR-198 (A-B / C-K) + VR-199 (A-I / J-K)	49	54	5
SR-206 (B-E) + SR-208 (B-C)	33	49	16
VR-144 (A-C / E-F) + VR-184 (A-B / D-F) + VR-190 + VR-191	52	54	2

[1]IR = Instrument Flight Rules
[2]VR = Visual Flight Rules
[3]SR = Slow routes
[4]L_{dnmr} = Onset rate-Adjusted Monthly Day-Night Average Sound Level

As stated in USAF (2004), "noise, [is] often defined as unwanted sound [and] is one of the most common environmental issues associated with aircraft operations. Concerns regarding aircraft noise relate to certain potential impacts such as hearing loss, non-auditory health effects, annoyance, speech interference, [and] sleep interference." Of these stated concerns, in regard to C-17 usage of MTR, annoyance by the aircraft noise is probably the dominant human reaction (USAF, 2004). Table 4 shows the percent of the population expected to be highly annoyed by noise at different levels. Pepper et al. (2003) reported that the Environmental Protection Agency's (EPA) noise exposure limits for neighborhoods are 55 decibels (dB) during waking hours and 45 dB during sleeping hours. As shown in Tables 2 and 3 the level of noise exposure that will be experienced by humans in areas that are flown over by C-17 aircraft flying MTR will certainly be at or exceed the EPA noise exposure limits during sleeping hours and when flying some MTR will be near the EPA noise exposure limit during waking hours.

R-1

Table 4. Percent of Population Expected to be Highly Annoyed by Noise (USAF, 2004).

Day-Night Average Noise (L_{dn})	Percent Highly Annoyed
<65	< 12
65 – 70	12 – 22
70 – 75	22 – 36
75 – 80	36 – 54
80 – 85	54 – 70
>85	> 70

R-2 Although it is difficult to assess, research suggests that aircraft noise may also have a negative effect on domestic livestock and wildlife (Pepper et al., 2003). Some of the negative effects that may be elicited by aircraft noise are interrupted feeding patterns, overall productivity, and decreased reproduction rates (Pepper et al., 2003).

While domestic livestock and wildlife cannot express their displeasure for aircraft noise; humans can. R-3 Humans have differing levels of tolerance for noise (Pepper et al., 2003) and therefore, the sound levels shown in Tables 2 and 3 may not be a valid guide for estimating human tolerance for the increased aircraft noise levels in areas of MTR. Just the increase in the annoyance levels of citizens living in these areas may elicit a negative response. A person's reaction to each additional C-17 flyovers, regardless of sound level, may be additive to the point that a complaint is registered.

In addition to increased utilization of MTR in west Texas counties east of Lubbock, Lubbock County, Texas; utilization of Lubbock International Airport (IAP) for military training purposes will also increase. Table 5 shows the average daily baseline and Table 6 shows the average daily proposed increase in military usage of Lubbock IAP by aircraft from AAFB. Although C-17 usage of Lubbock IAP does increase for both day and night closed pattern training, KC-135 usage does decrease.

Table 5. Average Daily operations, Baseline Conditions, Lubbock International Airport (USAF, 2004).

	Arrivals		Departures		Closed Patterns	
Aircraft	Day	Night	Day	Night	Day	Night
Air Carrier	18.836	1.638	18.836	1.638	0.000	0.000
Air Taxi	26.582	2.311	26.582	2.311	0.000	0.000
Gen. Aviation	22.874	1.989	22.874	1.989	17.196	0.000
C-5	0.000	0.000	0.000	0.000	0.000	0.000
C-17	0.878	0.076	0.878	0.076	0.655	0.000
KC-135R	1.755	0.153	1.755	0.153	1.310	0.000
Other Military	14.920	1.297	14.920	1.297	11.134	0.000
Total	85.845	7.464	85.845	7.464	30.295	0.000

Daily operations are based on averages of annual operations; therefore, numbers do not round.

Table 6. Average Daily operations, Proposed Action, Lubbock International Airport (USAF, 2004).

	Arrivals		Departures		Closed Patterns	
Aircraft	Day	Night	Day	Night	Day	Night
Air Carrier	18.836	1.638	18.836	1.638	0.000	0.000
Air Taxi	26.582	2.311	26.582	2.311	0.000	0.000
Gen. Aviation	22.874	1.989	22.874	1.989	17.196	0.000
C-5	0.000	0.000	0.000	0.000	0.000	0.000
C-17	0.878	0.076	0.878	0.076	0.996	0.388
KC-135R	1.755	0.153	1.755	0.153	0.000	0.000
Other Military	14.920	1.297	14.920	1.297	11.134	0.000
Total	85.845	7.464	85.845	7.464	29.326	0.388

Daily operations are based on averages of annual operations; therefore, numbers do not round.

As with the increased utilization of Lubbock IAP for C-17 training purposes so also, does the level of sound generated by military aircraft. Table 7 shows the baseline sound levels at Lubbock IAP and Table 8 shows that the land area and persons exposed to high levels of noise generated by C-17 aircraft will increase.

Table 7. Land Area Exposed to Indicated Sound Levels, Baseline Conditions, Lubbock International Airport (IAP; USAF, 2004).

	Day-Night Average Noise Level (L_{dn} dBA)					
Condition	67-70	70-75	75-80	80-85	85+	Total
Lubbock IAP						
Acres	1,602.0	738.8	329.5	171.6	45.6	2,887.5
Population[1]	545	1	0	0	0	546
Persons Annoyed[2]	93	0	0	0	0	93

[1]Population exposed is estimated based on census tract population data, ad the relative proportion of the tract encompassed by given contour levels.
[2]Persons expected to be annoyed is estimated based on total population exposed, and the average percentage of that population expected to be annoyed by the indicated noise level.

Table 8. Change in Land Areas Exposed to Indicated Sound Levels, Proposed Action, Lubbock International Airport (USAF, 2004).

	Day-Night Average Noise Level (L_{dn} dBA)					
Condition	67-70	70-75	75-80	80-85	85+	Total
Acres						
Baseline	1,602.0	738.8	329.5	171.6	45.6	2,887.5
Proposed Peak	1,619.6	771.2	331.8	173.2	46.6	2,942.4
Change	17.6	32.4	2.3	1.6	1.0	54.9
Population						
Baseline	545	1	0	0	0	546
Proposed Peak	546	3	0	0	0	549
Change						
Persons Annoyed[1]						
Baseline	93	0	0	0	0	93
Proposed Peak	93	1	0	0	0	94
Change		1				1

[1]Estimate based on average annoyance levels for indicated exposure
[2]Persons expected to be annoyed is estimated based on total population exposed, and the average percentage of that population expected to be annoyed by the indicated noise level.

One issue that is not addressed in USAF (2004) is that MTR IR-154 and IR-155 (Figure 2 in
Appendix) have north to south routes that have to be crossed by commercial and private aircraft
R-4 approaching Lubbock IAP from the east. Increased utilization of these MTR could have a
significant effect on commercial and private utilization of the intersecting airspace. Additionally,
increased utilization of Lubbock IAP for C-17 training purposes could also have an effect on the
R-5 utilization of Lubbock IAP by commercial and private aircraft, given that Lubbock IAP is a
public airport.

R-6 Increased utilization of the airspace between Lubbock, Lubbock County, Texas and AAFB by C-
17 military aircraft may cause increased annoyances to both human and animal inhabitants of
this area as well as the area in and around Lubbock IAP. Additionally, increased utilization of
this airspace and the Lubbock IAP by C-17 aircraft may have a negative effect on the intended
R-5 purpose of Lubbock IAP, which is to accommodate commercial and private aircraft traffic for
the convenience and economic benefit of the citizens of Lubbock. Although the Amarillo IAP
has not been considered in this response, air traffic utilization and noise levels there will also be
affected by increased utilization by C-17 aircraft from AAFB. However, in the list of "Persons
and Agencies Consulted in USAF (2004) no person or agencies in the State of Texas, the cities
R-7 of Lubbock and Amarillo, nor in counties that are over flown by MTR were consulted regarding
the effects of increased C-17 training.

Literature Cited

Pepper, C.B., M.A. Nascarella, and R.J. Kendall. 2003. A review of the effects of aircraft noise on wildlife and humans, current control mechanisms, and the need for further study. Environ. Manage. 32:418-432.

USAF. 2004. Draft: Environmental Assessment, C-17 Program Changes. United States Air Force, Air Education and Training Command, Altus Air Force Base, Oklahoma.

Appendix

PUBLIC NOTICE

THE UNITED STATES AIR FORCE
97th AIR MOBILITY WING, ALTUS AIR FORCE BASE, OKLAHOMA

Invites
PUBLIC COMMENT

ON THE ENVIRONMENTAL ASSESSMENT AND
FINDING OF NO SIGNIFICANT IMPACT
FOR C-17 PROGRAM CHANGES

The 97th Air Mobility Wing, Altus Air Force Base (AFB), Oklahoma, has prepared a draft environmental assessment (EA) and proposed Finding of No Significant Impact (FONSI) for the beddown of up to eight additional C-17 aircraft at Altus Air Force Base (AFB), Oklahoma. By the end of Fiscal Year 2007, all C-5 aircraft, associated manpower, support, and equipment would be transferred from Altus AFB. Many existing C-5 facilities would be converted to C-17 use and new C-17 facilities constructed. Furthermore, KC-135 transition training would be accomplished at other airfields. Altus AFB C-17 aircrews would accomplish low-level navigation training on 14 existing Military Training Routes (MTRs) in Oklahoma and Texas and night vision training would be accomplished at Clinton-Sherman Industrial Airpark (CSIA), Burns Flats, Oklahoma. Under the alternative action, an Assault Landing Zone would be built at CSIA or near Gould, Oklahoma.

The EA, prepared in accordance with the National Environmental Policy Act and Air Force instructions, evaluates potential impacts of the proposed action, alternative action, and no-action alternative on the environment. The EA evaluated: noise, air quality, earth resources, water resources, hazardous materials and wastes, biological resources, cultural resources, infrastructure and utilities, socioeconomics, and airspace.

Copies of the EA and proposed FONSI are maintained at the City of Lubbock Public Library, 1306 9th Street, Lubbock, Texas, 79401, and at the Office of Public Affairs, 97 AMW/PA, 100 Inez Boulevard, Suite 2, Altus AFB, Oklahoma, 73523.

Comments may be submitted through July 6, 2004 and should go to Gwen Brewer, 97th Air Mobility Wing Public Affairs, (580) 481-7700.

PRIVACY ADVISORY: Comments on this draft EA are requested. Letters or other public comment documents provided may be published in the final EA. Information provided will be used only to improve analysis of issues in the draft EA. Comments will be addressed in the final EA and made available to the public. However, only the name of the individual and specific comments will be disclosed.

Figure 1. Public Comment Invitation Published in the Lubbock Avalanche-Journal, June 6, 2004

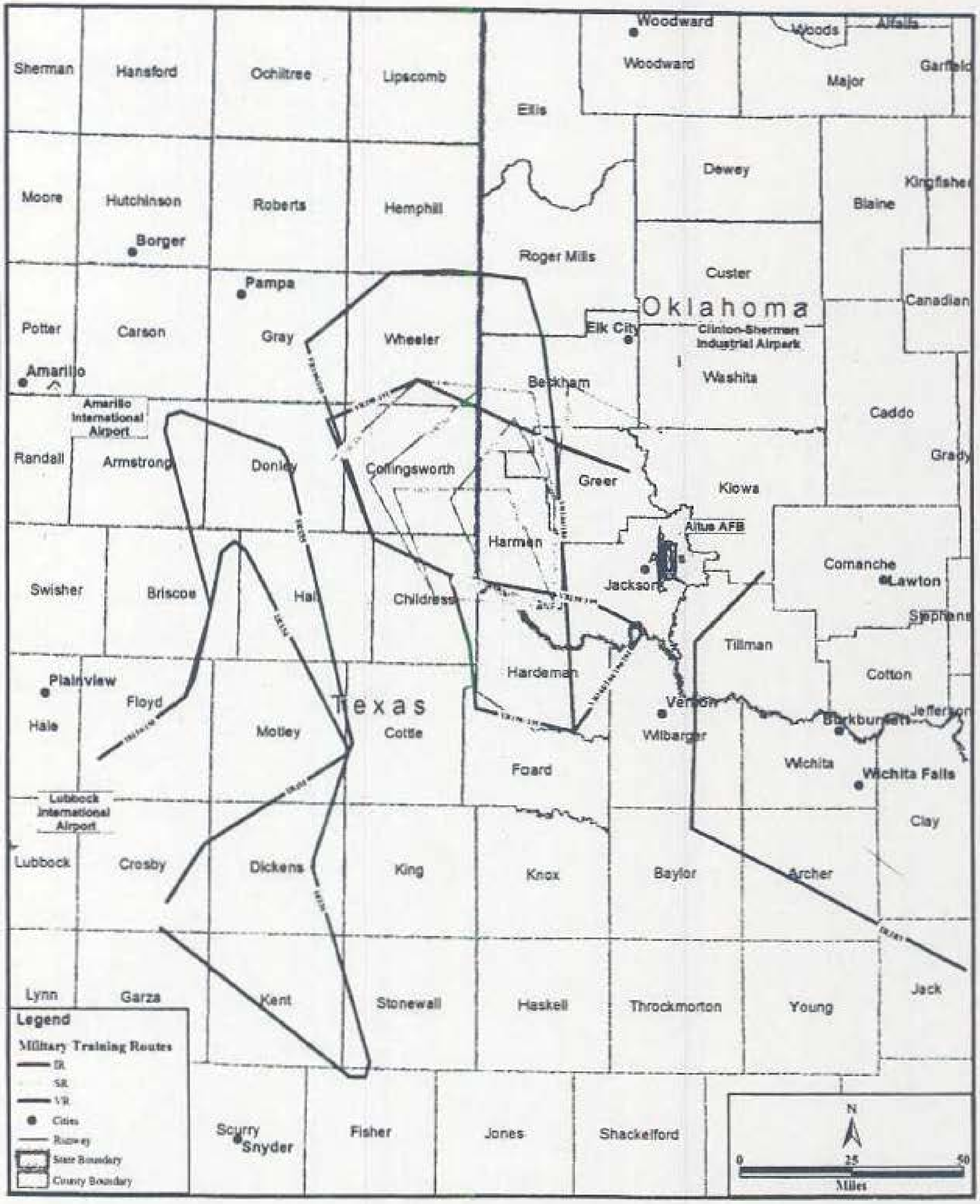

Figure 2. Military Training Routes (USAF, 2004).

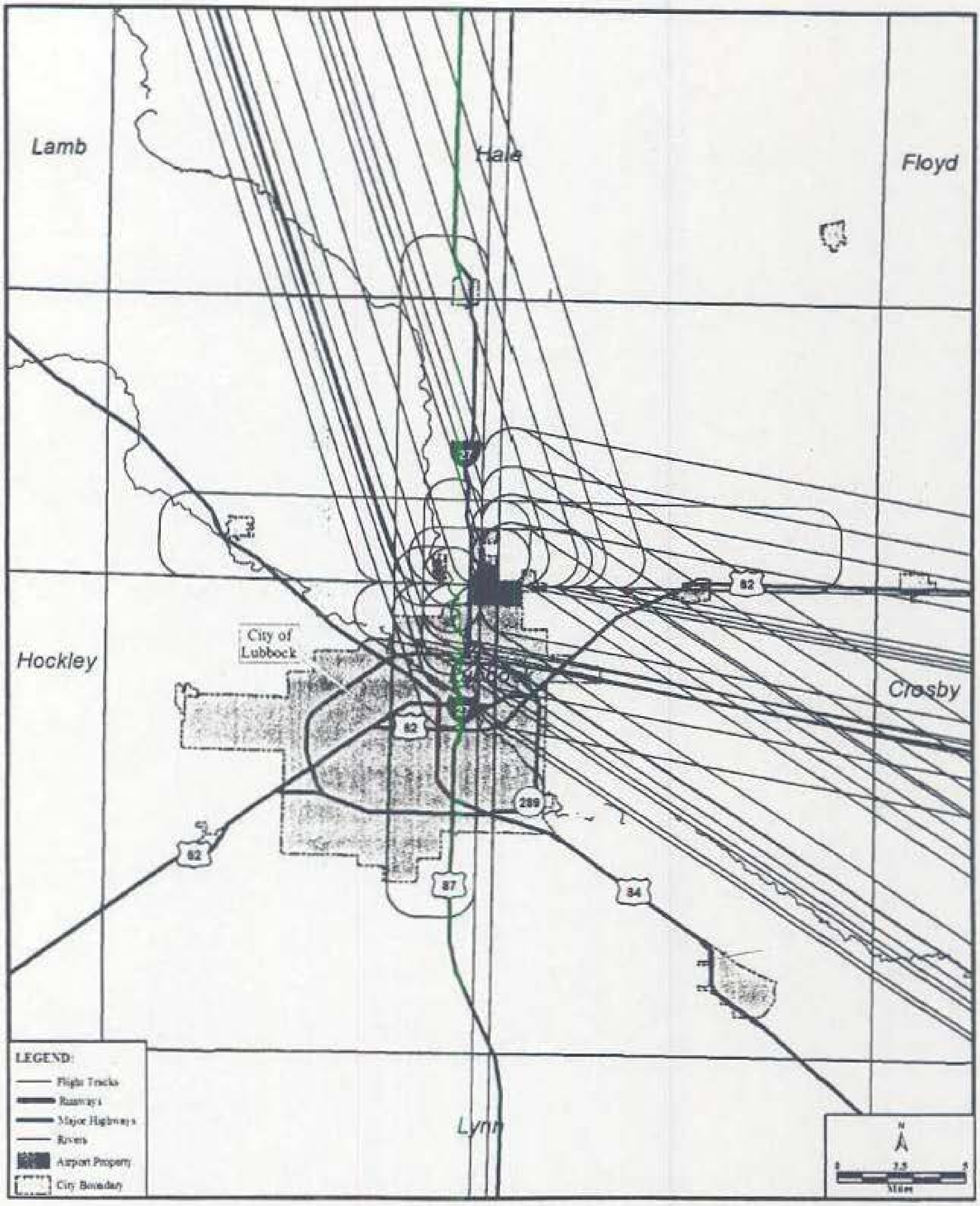

Figure 3. Aircraft Flight Tracks, Lubbock International Airport (USAF, 2004).

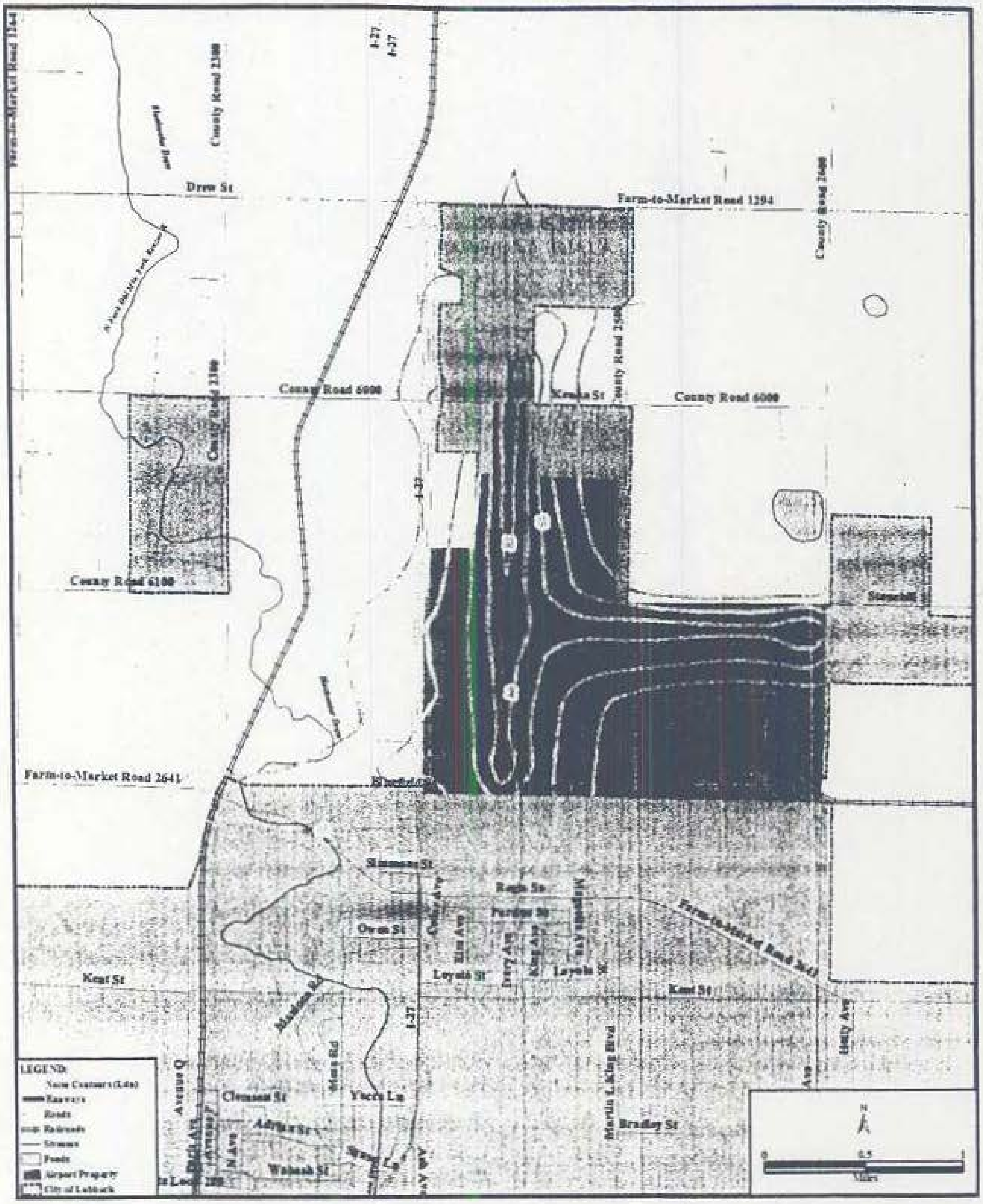

Figure 4. Baseline Noise Contours, Lubbock International Airport (USAF, 2004).

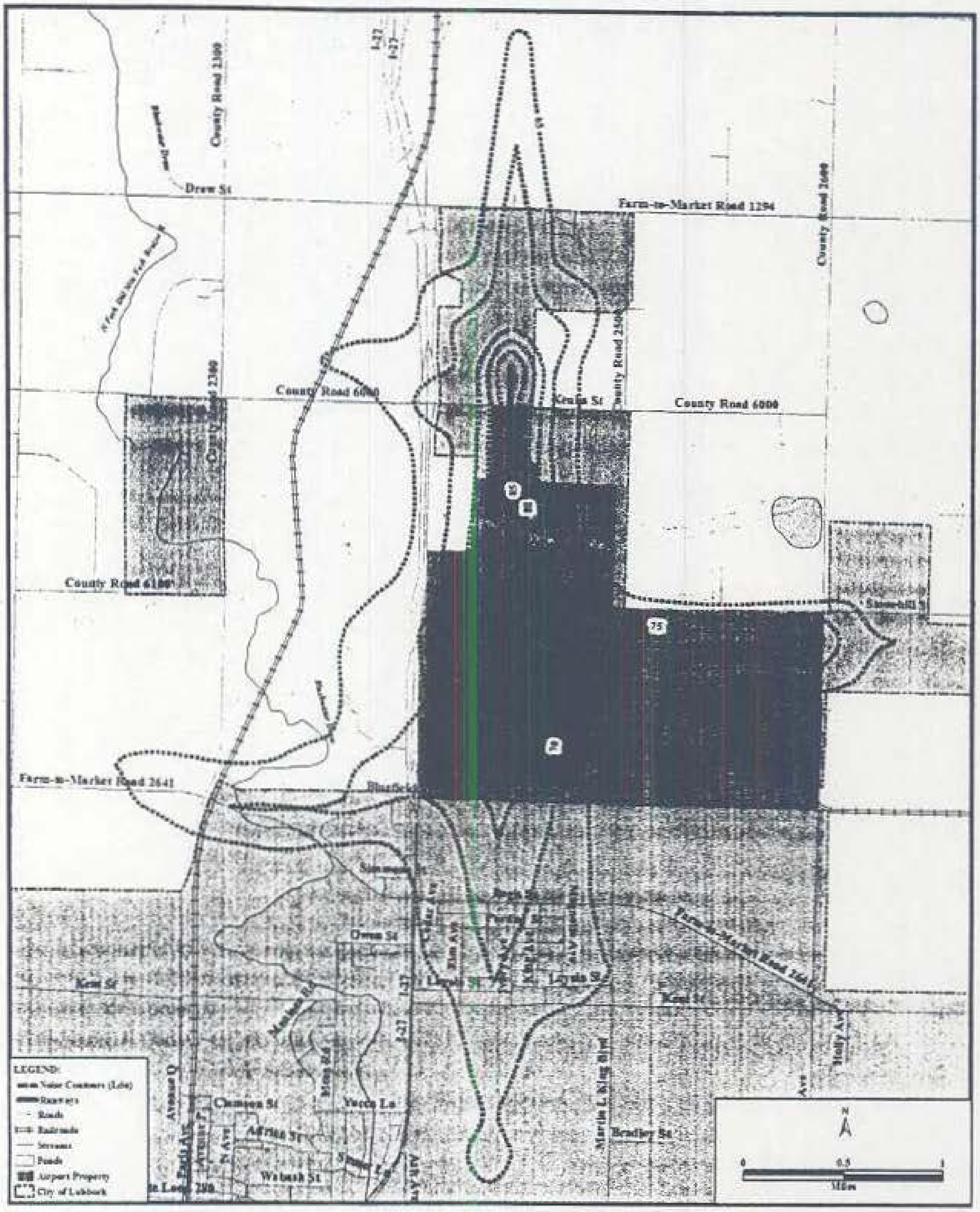

Figure 5. Noise Contours, Proposed Action, Lubbock International Airport (USAF, 2004).

CLINTON·SHERMAN INDUSTRIAL AIRPARK

July 7, 2004

Dan E Staton, Chief,
Environmental Flight
97th Civil Engineer Squadron
401 L. Avenue
Altus AFB, OK 73523

Dear Mr. Staton:

In regard to Paragraph 2.7.4 (Oklahoma Spaceport) of the Environmental Assessment - since the Oklahoma Space Industry Development Authority (OSIDA) board has decided ***not*** to pursue vertical launches at Clinton-Sherman Airport, the need for a launch pad at this facility is no longer an issue.

R-8

Suggest that the portion of the environmental assessment, which relates to launch sites and engine test cells at Clinton-Sherman Industrial Airpark, be eliminated.

We strongly suggest locating the Assault Landing Zone at Clinton-Sherman Airport.

Sincerely,

Mark McAtee
by N.P.

Mark M. McAtee,
Facility Manager

MMM:np

Copy: Jim Bellon
97CES/CEVN

Post-it® Fax Note 7671	Date 7-6-04 # of pages ▶ 1
To Jim Bellon	From Mark McAtee
Co./Dept. 97CES/CEVN	Co. CSIA
Phone # 580-481-7606	Phone # 580-562-4526
Fax # 580-481-5841	Fax # 580-562-4527

[redacted]

June 18, 2004

Mr. James Bellon
97 CES/CEV
401 L. Ave
Altus AFB, OK. 73523-5138

Dear Sir:

I am writing in regards to the draft environmental assessment primarily concerning the assault strip installation-sites 1 and 2 in Harmon County, Oklahoma. Our family is a 4th generation farming & ranching family in southwest Oklahoma. Our primary source of income is the grazing of stocker cattle on wheat pasture in the immediate location of the above mentioned sites. Our family owns two quarters of land in the proposed location of site 1 and one quarter in the proposed location of the drop zone expansion. Our primary concern is the inability to manage our grazing operation with the expected increase in noise level around the assault strip. The sites would cause equal problems for us. We

R-12

have experienced problems with the noise from the drop zone, but the much increased noise level caused by the assault strip will make the problems unmanageable and unworkable for our operation. We have found in our area that good wheat land for grazing purposes is not available for purchase and it would be extremely difficult to replace these grazing lands at a reasonable price.

Thank you for allowing us to voice our concerns.

Sincerely,

[redacted]

Jimmy Williams
[redacted]

Robert Williams
[redacted]

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
WASHINGTON, D.C. 20330

Air Force Representative
Federal Aviation Administration Southwest Region
Fort Worth, TX 76193-0910

9 Jun 2004

Mr. Jim Bellom
97CES/CEVN
401 L Avenue
Altus AFB, OK 73523

Dear Mr Bellon,,

R-9 I have reviewed your Draft Environmental Assessment for C-17 Program Changes dated Jun 2004 and coordinates without comment. Thank you for including this office in your coordination.

Sincerely,

Michael D. Rizzo

MICHAEL D. RIZZO, Lt Col, USAF
Air Force Representative, Southwest Region

Oklahoma Historical Society *Founded May 27, 1893*

State Historic Preservation Office • 2704 Villa Prom • Shepherd Mall • Oklahoma City, OK 73107-2441
Telephone 405/521-6249 • Fax 405/947-2918

June 29, 2004

Mr. Dan Staton
Chief, Environmental Flight
Dept. of the Air Force
401 "L" Avenue (97 CES)
Altus AFB, OK 73523

RE: File #1814-04; Altus AFB Proposal for Additional C-17 Aircraft, Jackson County

Dear Mr. Staton:

R-10 We are in agreement with your assessment that neither properties listed, nor eligible for the National Register of Historic Places will be affected by the proposed action, consisting of the beddown of up to eight additional C-17 aircraft at Altus Air Force Base.

R-11 However, if the foreseeable actions or "Alternate Action" (construction of the Sooner Assault Landing Zone, Site 1 or 2) occur, the State Historic Preservation Office must be informed of the intended action so that we can assist you in either avoiding or mitigating potential National Register eligible historic archeological sites identified within the drop zones.

Thank you for the opportunity to review this project. If you have any questions, please call Charles Wallis, Historical Archeologist, at 405/521-6381. Please reference the above underlined file number when responding. Thank you.

Sincerely,

Melvena Heisch

Melvena Heisch
Deputy State Historic
Preservation Officer

MH:pm